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The impact of mergers and acquisitions on bank efficiency in Europe

Urio, Hodian Nicholas

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The Impact of Mergers and Acquisitions on Bank Efficiency in Europe

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Hodian Nicholas Urio

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To Eli, Jackie, Julie, and Jennie, with love

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Abstract

This study investigates what impact mergers and acquisitions have on bank efficiency by examining both pre-merger and post-merger performance. Specifically, the research looks at the effect of bank efficiency on shareholder wealth creation upon bank merger announcement. The study finds supportive evidence that the market takes into account the pre-merger bidder bank's efficiency in adjusting the bank stock's price at the time of announcement. This suggests that bank efficiency has a significant positive effect on shareholder wealth creation when a merger is announced. Furthermore, in reacting to the announcement, the market also perceives the prospects for future enhancement of bank efficiency as a result of the current event. Thus, post-merger bank efficiency is found to also contribute to shareholder value creation on merger announcement. In particular, the study finds evidence suggesting that post-merger profit efficiency, rather than cost efficiency, has a positive effect on cumulative abnormal returns.

The study investigates 56 commercial bank mergers that took place in 22 European countries between 2001 and 2007. The event study methodology is used to determine shareholder wealth creation, employing the market model in estimating expected returns. Efficiency is estimated using the parametric stochastic frontier approach. Performance improvement in the combined firm is obtained by comparing post-merger efficiency with pre-merger efficiency, which is the sum of bidder and target efficiencies after weighting them based on their pre-merger total assets. To find out whether efficiency has an effect on shareholder value creation, regression analyses are performed involving cumulative abnormal returns, a few efficiency variables, and a number of control variables.

The main finding of this study is that pre-merger bank efficiency contributes to short-term shareholder value creation upon merger announcement. Some evidence is also found that post-merger bank efficiency has a positive effect on shareholder value creation at announcement time which is associated more with profit efficiency than with cost efficiency. Also, as the study finds statistically significant positive cumulative abnormal returns, the results of this study are supportive of the view that, increasingly, European merger studies that examine post-2000 data find that bank mergers are value-creating even for the bidding firms.

Evidence that pre-merger bank efficiency has a positive effect on cumulative abnormal returns, and that the market takes into account perceived future bank efficiency on merger announcement, underscores the importance of efficiency as a performance measure. If how the market reacts to a merger announcement reflects future efficiency performance, shareholders, policy makers, and other stakeholders may be able to take that as one of the factors on which they can base their decisions regarding the yet uncompleted merger. They can also use previous efficiency records for predicting short-term and long-term performance of prospective parties to a merger before announcement.

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Introduction

1.0 Introduction

This chapter presents a background on consolidation in European banking, states the objectives of the study and its contribution, and outlines how the rest of the thesis is structured.

1.1 Background

The financial services industry throughout the world has experienced considerable changes in the past two decades, due particularly to globalization and the spread of information technology. It is also attributable to deregulation and the easing of restrictive legislation that earlier had left banks without flexibility in the way they conducted their operations. Mergers[1] and acquisitions that started in Europe in the 1980s intensified in the 1990s, leading to a decline in the number of EU banks from around 9600 to just over 7400 in the period 1997-2003 (ECB, 2004a). The wave of consolidation that resulted in this decrease of almost 23% in the number of banks has been attributed to technological development, deregulation, launching of the Euro, and enhanced competition (Campa and Hernando, 2006). Most mergers were between domestic institutions. As banks merged, other institutions in the financial services industry did the same, particularly in the insurance sector, although in this case as well most transactions were domestic. The majority of mergers among the non-depository firms (security and commodity brokers, insurance agents and brokers) occurred in the UK where their activities are more advanced. Deals also took place amalgamating banks, securities firms, and insurance companies, to form financial conglomerates (Cabral *et al*., 2002).

[1] Merger is used throughout the study to also mean acquisition, takeover, consolidation, or amalgamation. Where use requires clarification, it is provided.

1.1.1 Early Merger Issues

As consolidation continued throughout the world in the financial services industry, it was happening in a number of other industries as well[2]. Merger activity involving those industries in Europe increased considerably in the late 1990s, not only in numbers but also in value per transaction. In the period 1997 to 2000, for example, the number of transactions went from 9,700 to 16,750 according to Campa and Hernando (2006). They report further that in 2000, the value of transactions in which an EU firm was involved reached almost 2,000 billion Euro. However, as a result of deceleration in economic activity and the downward valuation of organizations by the stock market, the volume of merger activity dropped after 2000. Mergers in the financial services sector followed nearly the same pattern of activity, peaking in the late 1990s and then declining after 2000, particularly in the first three years of the decade. The number of merger transactions in the sector rose by more than 47% between 1997 and 2000, increasing almost equally in the Euro Area (49%) and the non-Euro Area (47%). The literature points out that this period marked a significant qualitative change in the structure of the financial sector. Cabral *et al*. (2002) point out, for example, that prior to this time most mergers involved small firms which aimed at reducing costs to improve efficiency. As European national markets continued to integrate, institutions involved in mergers changed focus to pursue market power and consolidate competitive position. Towards the end of the 1990s, banks overtook other financial sector institutions to account for most mergers, especially in the Euro zone. Non-Euro EU countries (Denmark, Sweden, and UK) did not take up bank consolidation as aggressively at the beginning, presumably because banking concentration was already high there.

In their investigation of the European financial industry, Campa and Hernando (2006), like Cabral *et al*. (2002), also observe that initially most of the mergers took place among small financial institutions, and were primarily domestic. Concern for the rarity of cross-border mergers was raised by the European Central Bank in a report which observes that often international mergers within the EU involve an institution from outside the Union rather than between banks from different countries of the EU (ECB, 2000). As the European economy

[2] Telecommunications, chemicals and pharmaceuticals, motor, food retailing, and media are some of the industries that have been involved in mergers.

continued to integrate, banks would be expected to seek to expand to establish presence in a greater geographical market, but they have focused more on securing their share in the domestic market first as they face an increasingly competitive environment (Campa and Hernando, 2006). Cross-border mergers were therefore few at the beginning, and were carried out quite often with a European bank from outside the euro-zone and not with a bank from another euro area country (ECB, 2000).

Many banks sought to engage in mergers expecting to: (i) gain in efficiency through lower costs and higher profits, (ii) enhance their competitive position, (iii) cross-sell products upon gaining a larger customer base, and (iv) diversify risk geographically. Efficiency gains are identified by most merger studies as the main source of value creation (Houston and Ryngaert, 1994). They are made possible through the achievement of economies of scale, the cost savings made by removing overlapping functions, and the streamlining of backroom operations. In other words, quite often, post-merger gains are achieved after implementing restructuring strategies designed to realize cost-cutting or revenue-enhancing objectives.

1.1.2 Internationalization

To understand why banks would delay in engaging in cross-border mergers not only in Europe but also beyond the continent, it is useful to look briefly at internationalization in the banking sector. Restructuring operations following any merger is a difficult undertaking, but it is even more so for cross-border transactions. This may arise from differences in lines of business, culture, regulations, accounting systems, labour laws, and so on. Despite these challenges, mergers have contributed immensely to the internationalization of the banking sector. Internationalization of the sector has been going on for many years, but in the past two decades it has been encouraged by the liberalization of financial markets that has occurred in most countries. It is widely acknowledged that the main reason for allowing a foreign institution into a country is the belief that overall there is a net gain in that decision. Benefits to the local economy of foreign bank entry are usually realized in the form of improved resource allocation and enhanced efficiency (Goldberg and Saunders, 1981; Levine, 1997). Specifically, according to Levine (1997), foreign banks are assumed to: (i) foster bank competition and inspire use of the

latest banking skills and modern technology, thereby improving financial services quality and availability, (ii) contribute to the development of the country's supervisory and legal framework, and (iii) improve a country's chances for accessing capital internationally.

Initially, foreign entry of international banks into a country is often achieved at the expense of the local banks, small businesses, and even the government. Competition with a larger international bank which is widely known may be costly to the local banks as they often lose their business with existing multinational firms which prefer to deal with the international banks. Small businesses may suffer for lack of access to foreign bank services or do so at a high cost. Also, as foreign banks tend to be less responsive to government wishes, the latter may find their control over the local economy weakened. According to Claessens *et al*. (2001), foreign banks in developing countries usually have higher interest margins, greater profitability, and pay more taxes, while in advanced economies the opposite is true. Their findings also show that a larger share of foreign ownership of banks is associated with lower profitability and margins in banks that are domestically owned. They report further that it is the number of foreign banks in a country that has the most effect on competition and not their market share, suggesting that it is the impact of their entry which is considered most beneficial. In Pakistan, Turkey and Korea, foreign banks assisted domestic projects to access capital overseas (Bhattacharaya and Thakor, 1993). Liberalization has been shown to initiate faster growth of the financial sector and prompt increased competition in the banking system (Cho and Khatkhate, 1989).

Studies on South Eastern Europe generally find that the larger banks are more efficient than the smaller ones (Tsionas *et al*., 2003). The efficiency is mostly attributed to the existence of economies of scale. Looking at the period 1997-1999, Halkos and Salamouris (2004) find a strong association between size and efficiency. These results imply that average efficiency can be expected to rise as the number of mergers increases, since in that process small firms disappear. Achieving a large size can be used as a defence against hostile takeover. This is one of the main drivers behind many mergers in the world. It has, for example, been used in Turkey, Greece, and Romania by privatizing large banks to fend off foreign takeovers and preserve national pride. Large size backed by matching capital enables underwriting of large loans and

securities issues, which influences positively the demand for these services. Size also allows low cost improvement of brand recognition. And, at some stage a bank may, in the eyes of the authorities, become "too big to fail". This status may offer it a certain level of protection and may lower funding costs.

From the above discussion it can be seen that, for policy makers, it is important to know what benefits accrue from the decision to allow foreign banks to operate in the country and at what potential costs. With or without any merger taking place, internationalization of banking goes on and it is vital to understand its likely consequences. Claessens *et al*. (2001) conclude by stating that their findings support the hypothesis that in the long-term foreign bank entry is likely to improve the functioning of a country's banking markets, with positive welfare effects for bank customers. However, the authors also caution that allowing foreign bank entry may be risky, as low profitability of domestic banks caused by increased competition may lead to reduced charter values of those banks and expose their vulnerability. If the country's prudential regulations and supervision are weak, this may create instability in the financial system. They suggest as a solution to this likelihood that liberalization be well-timed, having put a satisfactory regulation and supervision regime in place.

1.1.3 Domestic and Cross-border Mergers

According to Fritsch *et al*. (2006), the value of mergers in the European banking industry for the fifteen years to 2005 reached almost 794bn US dollars, of which cross-border deals amounted to 203 billion US dollars. In that time, cross-border mergers rose from 25% to 40% of all deals, and the number of mergers in the CEE countries involving Western European institutions rose from less than 1% in the early 1990s to around 11.5% in 2005. In a different report, ECB (2006) documents the number of credit institutions in the EU-25 as having declined from 9,747 in 2001 to 8,684 in 2005. This decrease is the result of mostly domestic mergers which by far outnumber cross-border deals. According to Allen and Song (2005), of the 438 deals involving credit unions that they investigated covering the period 2001-2004, 68% were domestic. Increased consolidation within countries seems to many observers as an attempt by some nations to create "national champions" that can compete at the international level. This is a matter for concern

since as the number of firms decreases in the local banking market, concentration increases. For example, the average five-firm concentration ratio in the EU-25 was 33% in 2001 but rose to 45% in 2004 (ECB, 2006). On the other hand, where concentration exists and anti-trust issues have been raised, continued domestic mergers may be discouraged and cross-border deals promoted. Also, domestic mergers may create large institutions that may attract cross-border bidders looking for firms with a large local market share and domestic market power. Bidders may find it more efficient to acquire one relatively large bank with a significant market share than take over several small firms in order to achieve a similar market share.

The European Commission (2005) notes that within the EU the average cross-border targets are the same size as domestic targets, although on the average cross-border bidders are larger than domestic acquirers. Experience shows that on the average a bank is more likely to acquire minority shares in a cross-border deal than in a domestic merger. Another notable phenomenon is that for quite some time, cross-border consolidation took place primarily at regional level within the EU. For example, for mergers that have taken place within the EU-15 involving a Nordic financial institution, 90% of the deals occurred within the Nordic countries. This is also the case within the Benelux region where the ratio is 60%.

Figures 1.1 and 1.2, both of which are taken from ECB (2010), show bank mergers and acquisitions in number and value respectively for the E-27 countries in the period 2000-2006[3]. The graphs are presented to show a general picture of the situation prevailing in the years shown[4].

1.1.4 Consequences of Bank Consolidation in Europe

Decline in Number of Banks

[3] The figures include all deals entered into whether they resulted in controlling interest or not. These are the only figures presented in this study which also include minority stakes.

[4] ECB got the information from the Zephyr Bureau Van Dijk database where from time to time facts and figures are updated as more information becomes available.

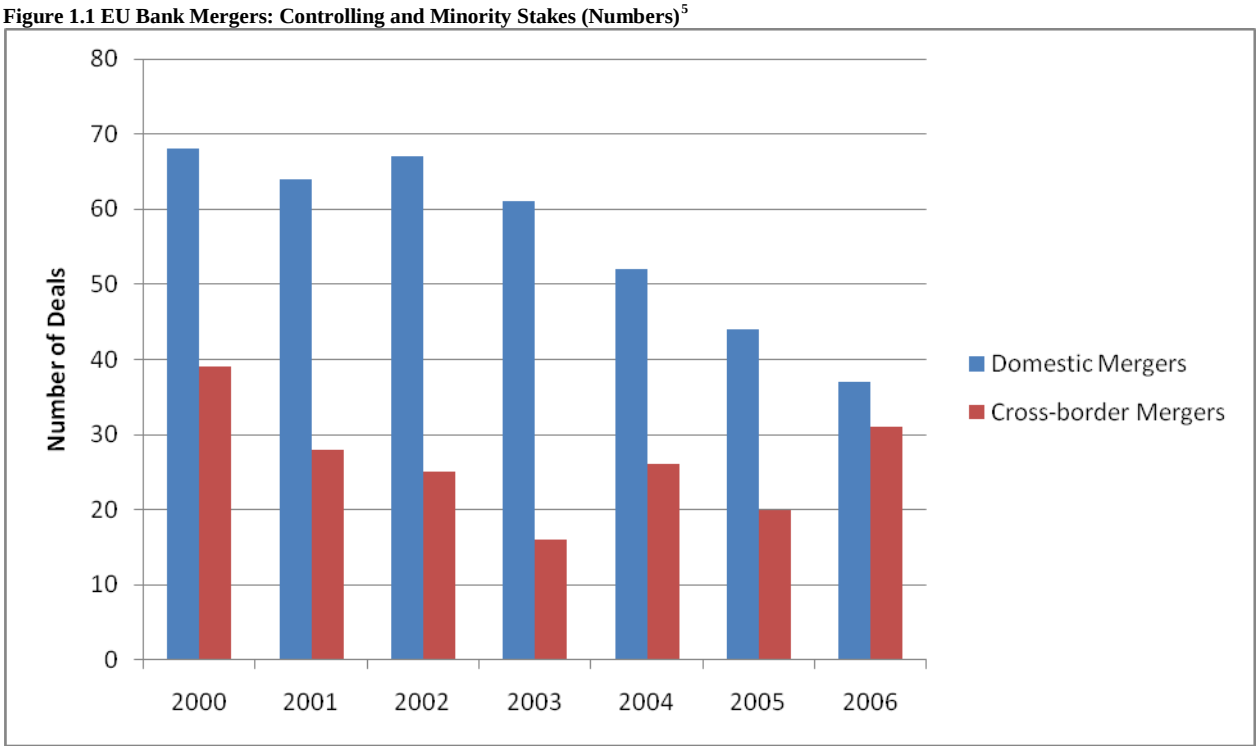
As a result of consolidation mainly, the number of banks in Western Europe declined considerably as stated at the beginning of this chapter. In another study, Schildbach (2008) reports that financial institutions in the EU-15 diminished in number from 9,624 in 1997 to 6,926 in 2006, a decrease of 28%. During the same period, on average banks grew faster in size than a country's economy. For example, while nominal GDP rose by only 4.3% p.a. in Western Europe from 1997 to 2006, bank assets grew by 12.2 % p.a. Also, the study reports that in 2006, the world's largest twenty-five banks held 41% of the world's 1,000 top banks' assets, up from 28% in 1997. This shows that, while banks as a whole experienced growth, the largest banks grew the fastest. Following consolidation, in Western Europe concentration measured as a percentage of assets of the five largest banks to total bank assets in a country, went up from an average of 48.1% in 1997 to 53.6% in 2006.

Expansion to the East

With the market already highly concentrated in some West European countries, especially in the Benelux and the Nordic countries, some banks started expanding overseas. However, most of the internationalization was prompted by the collapse of the Soviet Union, allowing the newly-independent states to privatize what were predominantly state-owned banks, and in the process facilitate acquisition by foreign institutions, a majority of them from Western Europe. Many banks took up this opportunity by making acquisitions in the CEE countries in search of new business and to gain a market foothold in that region. The trend picked up speed when some countries sought EU membership and started joining in 2004.

Bank acquisitions in the CEE region were prompted by the banking crises that many of those countries experienced early after their freedom from Soviet domination, with governments allowing foreign banks to take over their failed firms. Other circumstances that have engendered

Figure 1.1 EU Bank Mergers: Controlling and Minority Stakes (Numbers)[5]

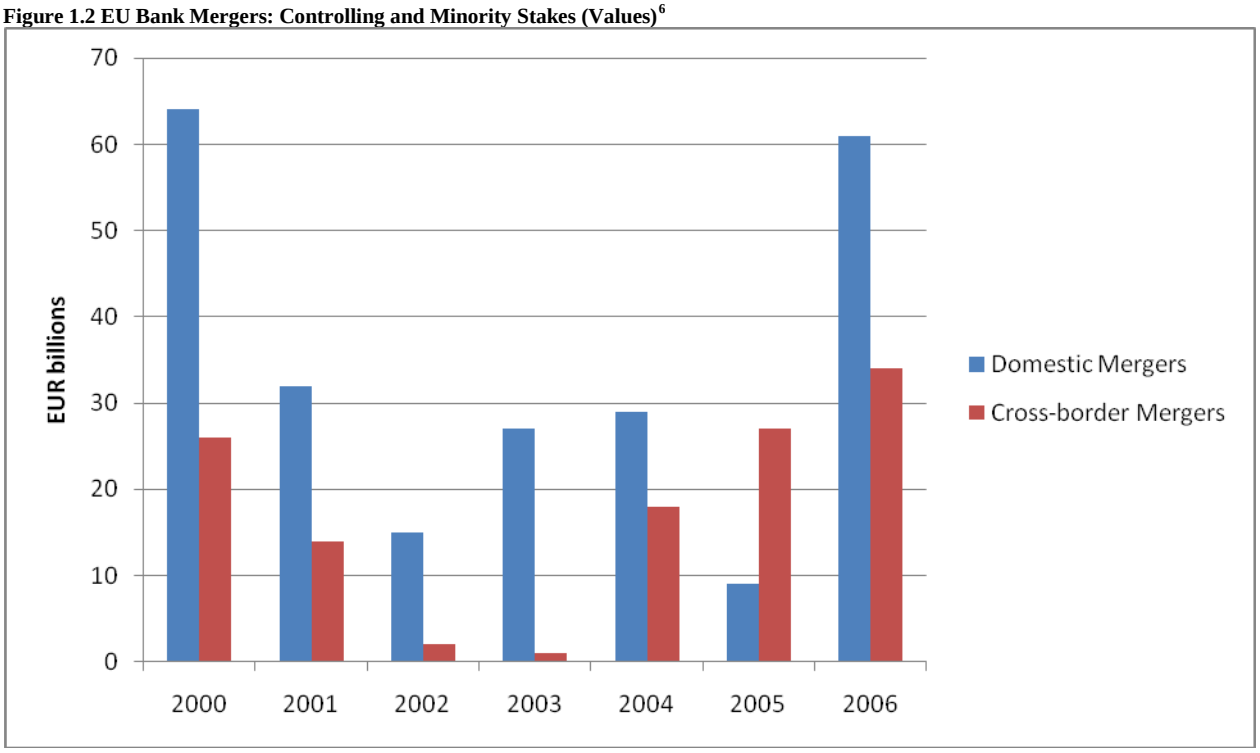


Source: Adapted from ECB (2010)

CEE acquisitions include the accession to EU membership and the privatizations that took place after independence to move from planned to market-led economies. New membership in the EU has given thrust to cross-border banking, with three of the new members having more than 80% of their bank assets in institutions from other EU countries, and three other members having close to 60% (Garcia, 2009). There is a likelihood of more cross-border mergers within Europe, including the CEE, as more barriers to consolidation are removed (European Commission, 2005). Opportunities for further consolidation also exist in the Commonwealth of Independent States where there are private banks but state-owned institutions can still be found.

[5] Cross-border mergers are intra-EU27 deals involving a non-domestic Acquirer.

Figure 1.2 EU Bank Mergers: Controlling and Minority Stakes (Values)[6]



Source: Adapted from ECB (2010)

Bank Concentration

One of the major consequences of bank consolidation is probably bank concentration as already mentioned, and it is useful to discuss it briefly. Considerable effort has been made in Europe to ease entry barriers to national banking markets and promote competition between financial institutions and improve their efficiency. This was the reason, for example, for the establishment of the European Monetary Union (EMU) and the enactment of various legislations to deregulate the provision of financial services across the European Union (EU). Deregulation has led to greater competition in Europe (Cetorelli, 2004; Goddard *et al*., 2001). Competition has in turn led to more efficient institutions. So, to a great extent the efforts taken by various policy makers across Europe achieved their intended purpose, but they also set in motion the ongoing wave of consolidation in the financial services sector. As consolidation leads to fewer institutions in the market, one of its consequences has been increased concentration. And as some studies have

[6] Value for some deals not available. Cross-border mergers are intra-EU27 deals involving a non-domestic Bidder.

found, fewer institutions in a market does not necessarily lead to more competition (Casu and Girardone, 2006). That is, competition is found to have led to more efficient firms, leading to overall greater efficiency in any one system, but higher efficiency does not in turn engender higher competition, as one would expect. This may lead to the view that concentration can enhance market power, which may impede competition, and therefore reduce efficiency. On the other hand, a more positive view may argue that when banks merge they do so focused on cutting costs and the resulting concentration comes with improved efficiency. In their study, Casu and Girardone (2006) find that the more the number of banks in a system the more competitive that systems tends to be. They therefore hope to find a negative association between concentration and competition. Surprisingly, they find instead that the most efficient banking systems in Europe also tend to be the least competitive.

In a nutshell, the establishment of the EMU and the enactment of legislation meant for advancing competition in the European banking industry have jointly had a notable consequence, which is an increase in more efficient banks. As they achieved higher efficiency, banks moved to enhance profitability, which they realized partly through acquisition of less efficient firms whose efficiency levels they have then sought to bring to their own. However, there is no evidence that once efficiency has been achieved across the European financial system(s) competition continues among existing banks.

It may be said that concentration has its roots in how consolidation in European banking started. The findings of Cabral *et al*. (2002) show that around the beginning of this decade, about four out of five (78%) European bank mergers were domestic. Most of the cross-border mergers were in the smaller countries of Europe. The 1990s ended without evidence of a notable trend towards cross-border bank mergers in the EU. Institutions showed a clear preference for consolidating domestically first before moving into foreign markets. As expected, this resulted in market concentration at national level, with the number of banks in the EU reduced by 23% between 1997 and 2003 (Campa and Hernando, 2006). This led to an increase in concentration at the EU level as well, though moderate. The authors state that in Spain the C5 concentration ratio (average share of assets of the five largest banks) rose overall by 12% from 32% in 1997 to 44%

in 2003. Concentration differs from country to country, with Germany having one of the least concentrated banking sectors, while the five-firm concentration ratio for countries like Belgium, the Netherlands, and Finland exceeds 75%. Examining the Euro Area alone, Bikker and Wesseling (2003) find that the C5 concentration ratio is lower than in the rest of Europe, having risen by only four percent from 12% to 16% in the period 1996-2001. Overall, increased concentration may be taken to be the result of increased market power. This is hardly a good sign for consumers, especially in those countries where concentration ratios have shot up to extreme numbers. Concentration usually leads to more market power and results in higher prices to the consumer. However, where there is a desire to create "national champions" able to compete at the international level, some policy makers might find this to be acceptable.

1.1.5 Other Developments in European Banking

In addition to consolidation, there have been a few other notable changes in European banking in the past thirty years, especially in the past fifteen years. This section examines the main areas of interest.

European Integration

Efforts to integrate Europe's financial markets targets the benefits that can accrue to financial as well as other firms but even more so consumers of financial and other products, in other words everyone. The focus of those efforts in the end is to reduce costs so that services and products may be provided at the least possible price without compromising quality. At the international level, European integration is designed to make Europe competitive, starting with the easing of trade and travel restrictions within European countries, and the introduction of the euro, among many other key measures. In banking, considerable progress has been made in interbank and wholesale markets, but work still remains in retail banking. Once implemented, integration in retail banking will make cross-border borrowing easier and faster and payments between countries more efficient. In the end, integration will lead to lower costs of conducting banking business, lower the cost of services to consumers, and further improve profits for banks. Progress already made in integration has made it possible for cross-border bank mergers to take place at a pace not considered possible in the 1990s.

Emerging Markets

Just as the European economic and business environments have changed considerably over the past two decades, so has the political and economic environment in the rest of the world. In particular, China has changed from a centrally-planned to a market-oriented economy, and so have the CEE countries. And for most of the developing world, countries have privatized formerly government-owned enterprises, liberalized trade, and also moved to a market-oriented economy. Across all these countries, notable economic growth has largely been realized. These Emerging Markets (EMs) have provided a huge opportunity for Western European institutions to expand by, among other ways, mergers and acquisitions. As incomes rise in the EMs, they will create an environment conducive to further foreign investment and make it more attractive to financial intermediation. Also, economic growth of the EMs will inevitably also lead to further competition at global level, a situation in which usually it is the large institutions that benefit the most. If that is the case, there is need for Europe's banking institutions to continue growing, which again can be achieved organically or through mergers and acquisitions.

Technology

Banking in Europe has also been greatly influenced by advances in technology. The IT revolution has facilitated fast and reliable flows of information between banks and consumers, between banks, and within banks. Cost savings generated by use of information technology have benefited both banks and consumers through profits and lower prices of products and services. Technology has also helped banks to innovate and introduce new products to respond to consumer demand. Some EM banks have moved to merge with Western European firms in order to benefit from the superior technology of the latter.

Direct Benefits

The above discussion serves to show how an environment has been evolving that has engendered consolidation in the banking industry. Banks merge for various reasons, all of which are meant to be for the benefit of a bank's shareholders. First, banks seek improvement in efficiency. When two banks merge, they can share best practice and take advantage of the most cost-effective

value-maximizing products, brands, and processes. Second, banks desire to become stable institutions. Larger institutions and especially those which are diversified are usually seen as being more stable and less likely to be shaken by adverse events that take place in one market or against one product. Third, banks look for economies of scale. A large bank is more likely than a small one to benefit from economies of scale where they exist. Fourth, banks seek to execute large transactions. There are extremely large transactions today, like syndicated loans, that need to be backed by a broad capital base and overseen by the most experienced personnel, which usually only large banks have. Fifth, banks know the benefits of public awareness. When a bank is large, the public is aware of it, the media, especially business and financial analysts, may cover it more regularly than it would a small bank, while the market values it as a major contributor to its total capitalization. This is useful to the firm in terms of the customers and shareholders it attracts, and the share of the market it commands. Also, the reputation of a bank is crucial for its long-term profitability. Six, banks, like all other organizations, prefer more than less degree of freedom of how they operate. When a bank is large enough and diversified geographically, preferably cross-border, it acquires a higher level of freedom for conducting its business by virtue of having a wider range of stakeholders. When the stakeholders are few, a bank may be restricted in the number of businesses it can engage in for fear of creating conflict with and ultimately losing a major stakeholder.

Bank Profitability in Europe

The current wave of mergers and acquisitions in Europe gained momentum at a time when banks were making substantial profits. Schildbach (2008) reports that for fifteen years since the early 1990s, on the average, return on equity (ROE) rose from 7.9% in 1994 to 16.8% in 2006 in the UK, France, Germany, Italy, Netherlands, and Spain. In the same period, ROE went up from an average of 2.8% to 22.0% in the Czech Republic, Hungary, and Poland, the three largest economies in Central and Eastern Europe. This performance has been attributed partly to the economic growth that was experienced in most of the world throughout that time, notwithstanding the setback of the Asian crisis (1997/98) and the “New Economy” bubble in 2002/03. The financial performance of European banks in this period is attributed largely to bank- and industry-specific factors. According to Schildbach (2008), the banks’ success can be

linked to the structural changes that have been implemented in the industry and individual institutions due to deregulation, globalization and technological advancements. Those changes may have led, for example, to major improvements in the Cost to Income Ratio (CIR)[7] of many banks which on average fell from 66.0% in 1994 to 57.0% in 2006 for Western European countries, and from 78.9% to 57.7% in the same period for the CEE countries. The profitability of banks in the past fifteen years formed a good basis for managers to engage in growth activities, hence the wave of mergers and acquisitions that continues in Europe.

1.2 Objectives of this Study

This study was undertaken against the backdrop of the above discussion. The research aims to assess the impact of consolidation on bank efficiency by investigating mergers and acquisitions that took place in Europe between commercial banks in the period 2001-2007. It has three main objectives, which are:

(i) to review consolidation in the banking industry and, using the US as benchmark, analyze the extant evidence with regard to bank efficiency and other performance effects caused by bank mergers in European countries.

(ii) to conduct an empirical analysis of the impact of European bank mergers on shareholder value using the event study methodology and, using the stochastic frontier approach examine the effect of those mergers on bank efficiency.

(iii) to determine whether, in its reaction to merger announcement, the market takes account of bank efficiency as it adjusts the banks' prices in response to the information received about the impending merger.

[7] The CIR is regarded in the banking profession as the main indicator of efficiency performance; the smaller the CIR the better.

1.2.1 Justification for using the US as Benchmark

This research uses the US as benchmark, for several reasons. First, the current wave of mergers, started in the US in the 1980s, and it is there where most studies on mergers and acquisitions have been carried out. Second, until the implementation of various legislations, the US with all its states could be compared, somewhat imperfectly, to Europe with all its countries. Those legislations were passed mainly to remove barriers to interstate bank branching and mergers, a parallel of deregulation, European Monetary Union, introduction of the Euro, the Second Banking Directive and all other legislative efforts that have been made to promote cross-border mergers, create a single financial services market, and generally internationalize banking in Europe. An issue can be raised about the culture factor in Europe, but so far it has not featured in studies as a major impediment to achieving desired goals. As for corporate culture, it is equally present in organizations on both sides of the Atlantic. Another reason for using the US as benchmark is that, although mergers have happened elsewhere as well, it has been largely a US and European phenomenon, and data is more readily available on the two regions.

1.2.2 Justification for using the Event Study Methodology

Event studies are the most frequently used method for measuring stock price reaction to both microeconomic and macroeconomic events, thereby creating or destroying shareholder wealth. Event studies are based on the major assumption that markets are at least semi-strong efficient, which allows instantaneous adjustment of a stock's price the moment new information becomes publicly available. The event study methodology is chosen for this research primarily because of this aspect, in that it measures directly the value that is created as the market reacts to an event, and it is straightforward. Above all, since stock prices are regarded as representing the present value of future cash flows, event studies are viewed as forward looking. The methodology is considered further in Chapter Three, where its weaknesses are also discussed.

1.2.3 Justification for using the Stochastic Frontier Approach

The Stochastic Frontier Approach (SFA) is used in this study for estimating efficiency. SFA, being parametric, is chosen over Data Envelopment Analysis (DEA), which is non-parametric, because in estimating efficiency, the former takes into account random error, separating it from

inefficiency, while the latter (DEA) attributes all deviation from the best practice frontier as inefficiency. However, this does not mean that SFA is superior to DEA, and both methods are widely used for estimating efficiency. Researchers who prefer to use DEA choose it mainly because, unlike SFA, it does not require specification of a cost, profit, or production function. SFA and DEA are the most widely used approaches for estimating efficiency and are discussed in greater detail in Chapter Four.

1.3 Contribution of this Research

The role of banks in a country's economy and in the international financial system makes them crucial institutions to not only be regulated and supervised but also monitored. Following a long wave of consolidation and many studies, it can still not be said, on the basis of research findings, that mergers are beneficial to bidding banks. Many studies, however, find that mergers are beneficial to the target's shareholders. For this reason, this study focuses on investigating whether the bidder's shareholders benefit from bank mergers[8].

Although for many years efficiency in banking was investigated mainly in the US, in the past decade studies of bank efficiency have intensified in Europe. Most of the studies have been on Western European banks, particularly those of the European Union. Even then, studies have tended to investigate banks in only one of a handful of the European countries. Some studies have combined banks from a few Western European and a few CEE countries, and other studies have looked at banks in individual CEE or a few CEE countries. The first contribution of this study therefore is that it investigates commercial bank mergers for which data were available from all the EU-27 countries and those aspiring to join the EU {Croatia, Former Yugoslavia Republic of Montenegro (FYROM), and Turkey}, as well as CEE countries.

The second contribution of this study is its coverage of the period 2001-2007. Few other studies have covered this period for the geographical region this study focuses on. What is notable about this period is that it is post-2000. The late 1990s was a period of intense merger activity in

[8] Campa and Hernando (2006), Knapp *et al*. (2006) and Cornett *et al*. (2003) are some of the studies that have examined merger benefits to bidding banks.

Europe and saw the largest merger transactions by value, although the intensity declined in the first few years of the new millennium. In 2004, merger activity started again in intensity. In other words, half of the period covered by this study was a time of low merger activity, while in the later half the earlier intensity came back. Studying mergers that took place in this period is also important in the sense that it is possible to detect whether they produce results different from those of mergers that took place in the 1990s. Previous studies have shown, for example, that whereas mergers of the 1980s were rarely beneficial to the parties involved, those of the 1990s were value-creating, particularly for the targets' shareholders. This has led to the suggestion that merger benefits may be related to the period covered. Since the 1990s decade showed improvement over that of the 1980s, there is curiosity as to whether the 2000s decade will outperform that of the 1990s. Most studies on the 1980s and 1990s data investigate US mergers where consolidation was more prevalent than elsewhere. Of even greater importance is the view that post-2000 European studies increasingly find that mergers are beneficial (DeYoung *et al*. 2009).

The major contribution of this study is achieved by examining shareholder value creation in mergers. Specifically, the study investigates the effect of cost and profit efficiencies on stock price at the time of merger announcement. Mergers are analyzed with respect to pre-merger efficiency as well as post-merger efficiency for each of the first three years after merger. There is only one other study that examines the effect of bank efficiency on shareholder value using European data (Chronopoulos *et al*., 2010). That study differs from this in six major ways. First, while they use data envelopment analysis (DEA) in estimating efficiency, this study employs the stochastic frontier approach (SFA). Second, this study employs the market model for estimating normal returns, while the above study uses a modified market adjusted model. Third, their study combines US and European mergers, while this study is on European mergers alone. Fourth, their study investigates mergers that took place in the period 1997-2003, while this looks at the period 2001-2007. Fifth, their research involves only 30 European mergers while this study analyzes 56 mergers from the region. Last, this study involves 22 countries of the EU-27 and those aspiring for membership as mentioned above, while theirs involves only the EU-15 countries.

In the US, there have been only two studies comparable to this one. The first is Kohers *et al.* (2000), which investigates both cost and profit efficiency, and, as a result, it is similar to this in that respect, but uses fewer control variables than those used in this study in the analysis performed in Chapter Six. The second is Aggarwal *et al*. (2006), which examines only profit efficiency and differs from this for that reason, but uses similar variables to this study while also employing a similar event window for the analysis performed in Chapter Six.

None of the other studies that have examined bank shareholder value[9] or examined bank efficiency[10] in European banking have carried out an analysis similar to that performed in this study.

1.4 Why Study Banks

In the light of the considerable effects of consolidation in the financial services industry and the other developments in European banking discussed earlier, it is useful to revisit the importance of banks. Probably the most important quality of banks is that they are fragile, and the failure of one can have wide-ranging repercussions for a country's economy. This is one of the main reasons why they are regulated and supervised. Secondly, banks have an information asymmetry problem. Traditionally, they earn their profits from lending, sometimes to people or institutions on which they cannot have a full record. Information asymmetry implies that banks have to take risk in doing business otherwise some of their customers might never be able to borrow. Banks try to reduce information asymmetry by keeping a track record of a customer in a long-term relationship. Thirdly, people generally do not change banks as frequently as they do other service providers. For this reason, the competition for customers has historically been less severe in the banking industry than in other industries. For most of the last century, this translated into overall competition in banking being less than that found in other industries. This suggests that

[9] Cybo-Ottone and Murgia (2000), Beitel and Schiereck (2001), Campa and Hernando (2006), and Schmautzer (2006) are some of the studies that have examined shareholder value.

[10] Vander Vennet (1996), Resti (1998), Huizinga *et al*. (2001), and Azofra *et al*. (2008) are some of the studies that have examined efficiency.

competition has to be stimulated from the outside, a justification for authorities to intervene on behalf of the shareholders, customers, and often for the public at large.

Banks operate in a financial market where they are the most important participants. In any financial market there are scale economies to be exploited. The larger the market is the larger the scale economies. In a quest to diversify risk, banks seek to expand into financial markets in order to take advantage of scale economies. One of the reasons for diversification is risk minimization. The existence of participants in the financial market that operate at the international level has made it possible for banks and other financial institutions to promote the globalization of financial services. In Europe, the introduction of one currency was meant to eliminate currency risk, thereby increasing competition between institutions which earlier faced losses occasioned by currency fluctuations. More competition is beneficial to consumers – borrowers and lenders alike. Lenders invest where they can get the most return for their savings. Borrowing opportunities wisely used promote economic growth. In Europe, a single market and one currency are advocated because they allow a country with borrowing needs to do so from anywhere where there are savings in order to promote economic growth. It is against this background that mergers in banking have taken place.

Studies in other industries, where consolidation has been going on as well, indicate that overall mergers are not beneficial. If that is so with other industries one may suppose that it would be the case also for banks. It therefore makes sense to study mergers to find out whether they are beneficial, and to whom. It should be expected that a merger will be beneficial to at least the shareholders of the resulting organization. A merger can also be beneficial to a bank's customers and to the public in general. This is possible if, for example, the resulting organization can reduce its charges, enhance the quality of its products, widen the range of its product offers, and operate over a larger geographical area through which it can reach more customers. Ultimately, a merger is beneficial if post-merger performance is an improvement over pre-merger performance.

One of the main reasons banks merge or acquire others is in order to grow as a result of competition. The larger a bank is the more the products it can offer, and the farther it can extend its services geographically. Studying mergers in the financial services industry seeks to find out how valid these claims are. An important aspect of the study of bank consolidation is that policy makers can use previous studies to compare them with the performance of firms currently seeking to merge. By doing so it should be possible for them to predict which mergers are likely to succeed and which might not, and this may guide their decision. One of the things that have made it possible for mergers to take place at the pace that the world has witnessed in the past two decades world-wide is the relaxation of regulations that existed before. In addition, in Europe there has been the introduction of the euro, and legislation intended for promoting competition. All these measures were intended for improving on what existed earlier. Outcomes of those actions should be examined and evaluated to determine the extent of their impact, comparing it with what was envisaged. Such studies are also useful to intending acquirers and targets for evaluating their prospective partners.

1.5 Why Study Efficiency

It is customary for organizations to evaluate their performance, often using an agreed benchmark to judge how well exactly they are doing. This is more so in a competitive environment, like the one in which consolidation has taken place in Europe. Comparing an organization's performance with that of the industry, or that of its peers in the industry, or previous performance is a common practice. In the past, performance ratios calculated from financial statements were relied upon for such evaluations. However, although they are still in use, they have disadvantages which render them unsuitable for providing a consistent measure of firm performance. Among their disadvantages are that financial data can be manipulated in order to produce favourable ratios, and that they leave room for incomparability where firms use different accounting systems. Today, use of statistical techniques for measuring efficiency is considered a superior way of evaluating performance in both business and non-business institutions.

Authorities that regulate the financial industry often cite efficiency benefits as one of the objectives of legislation that aims to promote competition. If firms are efficient they should

generate profits while at the same time being able to provide high quality products at lower prices than they would if they were not. Defined simply, efficiency in banking refers to the efficient use of inputs in banking operations to produce desired output. A bank is efficient if it uses less of a bundle of inputs to produce a set of output, or with a bundle of inputs it produces more output than normally expected. In measuring efficiency, evaluation is made of the success or otherwise of a bank's management in controlling costs and generating income. With increased competition, technological advances, and diversification, the structure of financial institutions has changed considerably over the last two decades. Fee-based income, for example has been increasing steadily in that period, and off-balance sheet activities have intensified for many banks. At the same time, securitization, while allowing banks to lend more than previously possible, has also led to financial institutions taking unnecessary, sometimes reckless, risks. In such an environment a performance indicator more robust than ratio analysis is called for to measure bank performance. Efficiency measures meet that need to a great extent.

For most of the last three decades, the literature on bank efficiency has been dominated by US studies. However, in recent years European studies have increased, and the trend shows growing interest to do more research on the subject. This research will be one more of the increasing number of bank efficiency studies. Most of the earlier studies on bank efficiency estimated economies of scale and scope, focusing mainly on cost advantages. A major deficiency of the methodology was that it could not capture all efficiency differences between institutions. Current methodologies are considered superior in that a bank's efficiency is estimated relative to an efficiency frontier.

1.6 Why Study Mergers

The core objective of any business enterprise, irrespective of any industry, is to make profits. But profits in themselves do not mean much to the individual unless they are paid out as income in the form of salary to employees, dividends to shareholders, accounts payable to suppliers of goods and services, or taxes to the government. It is the managers and the shareholders who have the greatest stakes in the profits that the firm makes. In the modern firm, most decision-making is left to the managers by a large number of shareholders who rarely have time to monitor closely

how the firm works on a day to day basis. Managers have interest in seeing that the firm makes as much profit as possible for two main reasons: first, the more the profits the more they can allocate for themselves as salary and other benefits; second, the higher the profits the larger the proportion they can recommend to shareholders for retention in the firm for investing in profitable projects. Investments are a way of growth and they generate more profits to be again used for the benefit of the firm's stakeholders.

It can be said that generally managers are happier retaining profits for further expansion (growth), which guarantees a handsome income for them and continued employment, than in paying dividends to shareholders. They will therefore pay dividends at levels that will ensure that shareholders are just about satisfied and willing to raise their share of equity in the firm if asked to do so. Managers are also aware that it is important to pay dividends at levels that guarantee the continued reputation of the firm and its attractiveness to potential shareholders. Otherwise, managers are focused on making profits, both in the short-term and in the long-term, and re-investing them in growth opportunities that arise continually in business. If necessary they will accumulate profits for a number of years while waiting for a growth opportunity to arise. Such growth includes expansion through merger or acquisition.

Most of the research on the 1980s and 1990s data finds that mergers are not beneficial to the shareholders. This has led to the supposition that managements engage in mergers in their own interest and not that of their shareholders. Where this is determined conclusively to be the case, the appropriate authorities have the responsibility for discontinuing such mergers, and for scrutinizing more intensely than previously new merger proposals before approving them. There is stronger evidence in the US than in Europe that the 1980s and 1990s mergers were not beneficial. This alone is probably a valid reason to continue research in European mergers until consensus is reached on the benefits or otherwise of bank mergers. It is important to note, however, that mergers cannot be eliminated completely as they have always existed, and when they occur outside a merger wave they usually tend to be undertaken solely in the interest of shareholders. It is mergers that take place during a merger wave that can sometimes be

questionable, as many firms seek to cease the opportunity for expanding even when it is not beneficial to do so.

1.7 Why Study Europe

As an economic region, Europe is second only to the US in the number of mergers that have taken place in the past twenty-five years and yet for so long merger studies were confined to US data. Although in the past ten years there has been considerable European research in the area, there remains a lot to be done because of its unique multi-country and multi-cultural nature, the separation from the Soviet Union of the CEE countries not too long ago, and the continuing expansion of the EU. These aspects offer a lot that is important and useful for research in the European banking industry.

1.8 Structure of the Thesis

1.8.1 Chapter Two

This chapter starts by reviewing merger causes and motives before looking at merger success factors. Also considered are the theories on which shareholder gains in mergers are based. There is a discussion of what firms may usually be targeted for acquisition, and a few observations on the effect of mergers on the merging banks' customers.

Since this study covers a number of European countries between which bank consolidation has taken place, cross-border mergers are discussed at length. In the same token, the effect of bank mergers on European integration is considered briefly towards the end of the chapter. Also, since the study uses the US as benchmark, considerable space is devoted to comparing evidence of post-merger bank performance in the US and Europe, distinguishing between pre- and post-2000 research findings.

1.8.2 Chapter Three

In this chapter, shareholder value gains upon merger announcement are analyzed. Parties to a merger are alerted early to the likelihood or otherwise of achieving their goal, at least in the

short-term, by how the market reacts to the deal announcement. If the market foresees difficulties in implementation of the merger, it will reflect them in the stock prices of either party around the announcement time. After reviewing how firm information is impounded in the stock price, the chapter presents the event study methodology widely used for estimating the abnormal returns that may occur on merger announcement. Positive abnormal returns are a gain to shareholders.

The chapter develops various hypotheses which are then tested in connection with the interpretation of the empirical results. The overriding purpose of the chapter is to get CAR results which can be regressed on efficiency and a number of control variables in Chapter Six to determine the effect of efficiency on CARs.

1.8.3 Chapter Four

This chapter provides an overview of bank efficiency by reviewing the various concepts found in the literature. Economies of scale and scope are presented before considering the concept of X-efficiency. Technical and allocative efficiencies are examined in greater detail and illustrated with diagrams that make the concepts clearer, bringing in cost as well as revenue efficiency. The two concepts currently most widely in use are cost and alternative profit efficiency and these are considered last. Bank inputs and outputs are discussed, pointing out the special case of deposits which are in this study regarded as inputs under the intermediation approach to estimating efficiency. In some studies deposits are analyzed as outputs, and there is no consensus on which treatment is superior to the other. The main parametric approach to estimating efficiency, stochastic frontier approach (SFA), and the non-parametric approach similarly used widely, data envelopment analysis (DEA), are then considered.

The chapter also discusses bank efficiency determinants, and merger effects on bank efficiency. Throughout the chapter, literature on the topic under discussion is reviewed.

1.8.4 Chapter Five

This chapter analyses efficiency in the bank mergers forming the sample of this study. After presenting the model used in estimating efficiency, the chapter considers the hypotheses that are relevant to the empirical analysis. Unlike the shareholder value gain analysis in Chapter Three which included only bidders, the analysis in this chapter includes targets as well. Efficiency is estimated in two main sections. The first section estimates both cost and profit efficiency for the year before merger for the full sample, comparing merged banks with non-merged banks. Efficiency is also estimated for a number of sub-samples.

In the other section, post-merger cost and profit efficiencies are estimated for the combined firm for the first, second, and third years after merger. The efficiency of each year is then compared to the pre-merger efficiency to see whether there is any improvement. The pre-merger efficiency of the combined firm is calculated as the sum of the pre-merger bidder and target efficiencies weighted using their pre-merger total assets. This analysis is also done for the full sample as well as for a number of sub-samples.

1.8.5 Chapter Six

In this chapter the empirical results of Chapter Three and Chapter Five are brought together in a regression analysis where CAR is the dependent variable, while efficiency is the main explanatory variable. The other explanatory variables are control variables known to have an influence on CAR. The aim is to find out whether, when it responds to a merger announcement, the market takes account of bank efficiency when there is a movement in stock price.

1.8.6 Chapter Seven

This chapter summarizes the main findings of this study. In addition, it discusses its limitations and proposes avenues for further research.

2

Consolidation in the Banking Industry

2.0 Introduction

This chapter provides an overview of mergers and acquisitions by discussing primarily their causes, motives, and performance. The literature is reviewed throughout the chapter to provide a sense of what has occurred, especially in the US and Europe, over the past twenty years or so. The chapter ends with a comparison of bank merger performance in the US and in Europe.

2.1 Bank Merger Causes

Consolidation usually happens as the result of several macroeconomic and microeconomic factors working together. These would combine to change the environment in which banks operate, to which then banks would react in order to preserve and improve shareholder wealth. Macroeconomic factors comprise those changes exogenous to the banking industry that have changed the industry's economic environment. Chief among them are globalization, technological change, and deregulation. Globalization and technological change have happened almost as uncontrollable forces, whereas deregulation has been deliberate and meant to enable competition leading to consolidation. Globalization started earnestly after the economic recovery of Western Europe and Japan from World War II. It accelerated in the 1970s and 1980s. This followed the collapse of the fixed exchange rate system in 1971 in which the US dollar was pegged to gold and other currencies to the dollar. As the new floating exchange rates system took root, capital controls by government ceased to be critical. When restrictions were removed, capital flows between countries intensified, and the market was left to set prices and determine the movement of investment funds around the world. This is the global financial system as it exits today, with many participants competing for funds or provision of services. It is a competition which also increases risk for those who participate in the market. To minimize risk, banks seek to diversify, and one way of doing so is by merger or acquisition. As globalization

continued the information and communications technology revolution was also picking up momentum.

Technology might have lowered operational costs, especially at the beginning, but its most important contribution is the near elimination of space and time across the globe. Today, funds transfers across the world take place at the touch of a button. Another major contribution of technology has been the ease with which banks and other financial market players can use it to innovate. Through technology, banks can engineer new products and formulate new ways of managing risk. The resulting environment is one where an institution must compete in order to survive and thrive. As it happened, one way in which many banks responded to this environment was to consolidate. Banks could not respond to the environment created by globalization and technology through consolidation without legal back-up; hence all the legislation which has been effected in various forms across the world.

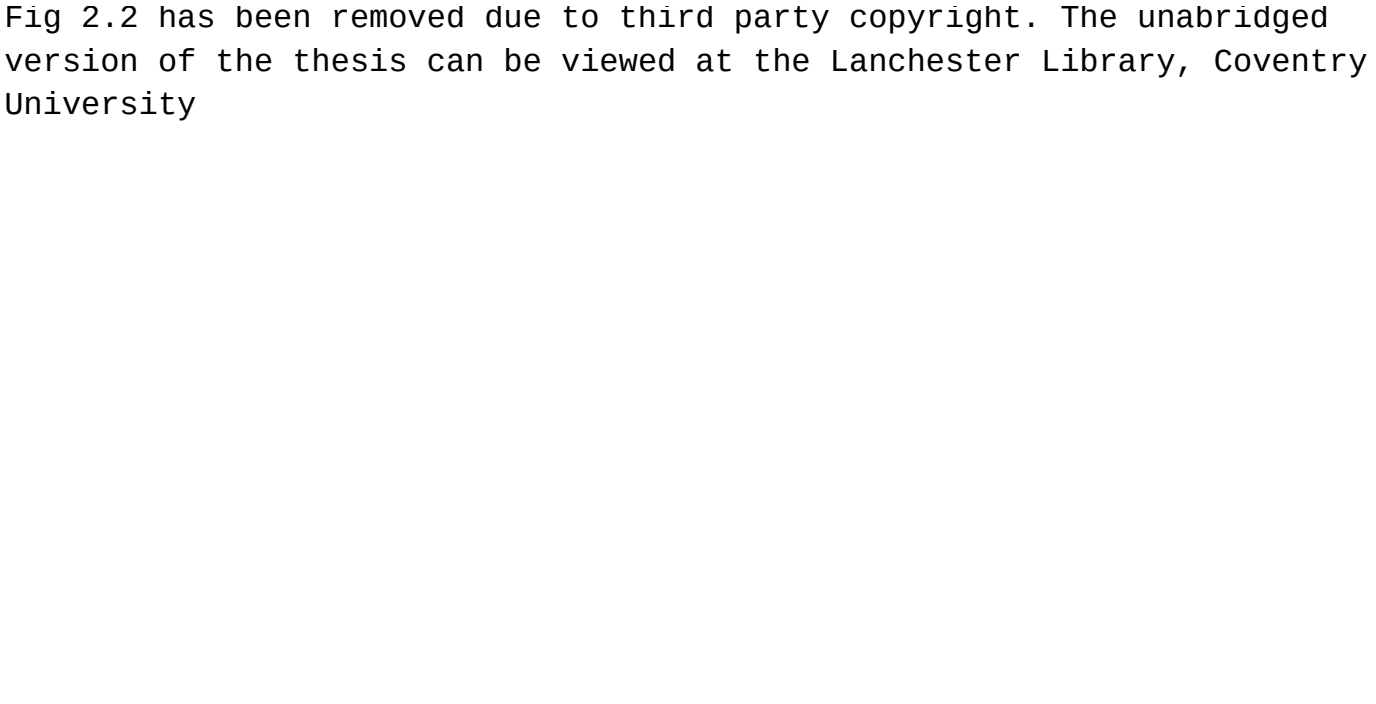
Figure 2.1 to Figure 2.4 depict merger activity in the financial institutions sector in 2005 across the globe. The dominance of North America, Europe, and Asia as both sources and destinations of acquisitions shows vividly. These being the world's major economic regions, any difference with any other year will be minimal for the period from the late 1990s to the present.

Sometimes, other events that occur in an economy may influence mergers one way or another. Causes of consolidation can therefore differ from period to period. For example, Jones and Critchfield (2005) report that forces that drove bank mergers in the US in the 1990s differed considerably from those that did so in the 1980s. Economic conditions in the 1980s were substantially harsh for the banking industry and it operated under an outdated legislative and regulatory system. Many banks were unprofitable, and many failed. In the 1990s, several factors

Figure 2.1 Bidder Banks (Number of Transactions) 2005

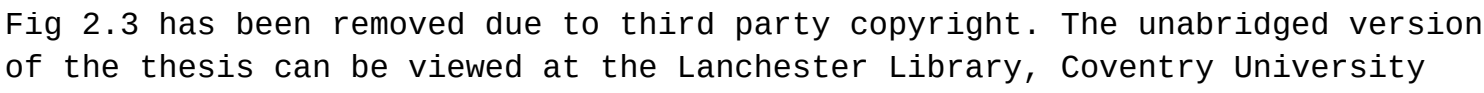
Source: Fiordelisi (2009)

Figure 2.2 Target Banks (Number of Transactions) 2005



Source: Fiordelisi (2009)

Figure 2.3 Bidder Banks (Transaction Values) 2005



Source: Fiordelisi (2009)

combined to reverse the earlier climate. First, around the middle of the 1990s to the end of that decade, banks were highly profitable, and many enjoyed surplus cash as they operated in a favourable economic and interest-rate environment. Second, the Riegle-Neal Act was passed in 1994, removing barriers to interstate banking and branching. Many banks took advantage of this to seek consolidation of operations and geographical diversification through acquisitions. Third, a bull market in share prices raised bank market valuations to such levels that banks started to use their stock as currency in the acquisition of other firms.

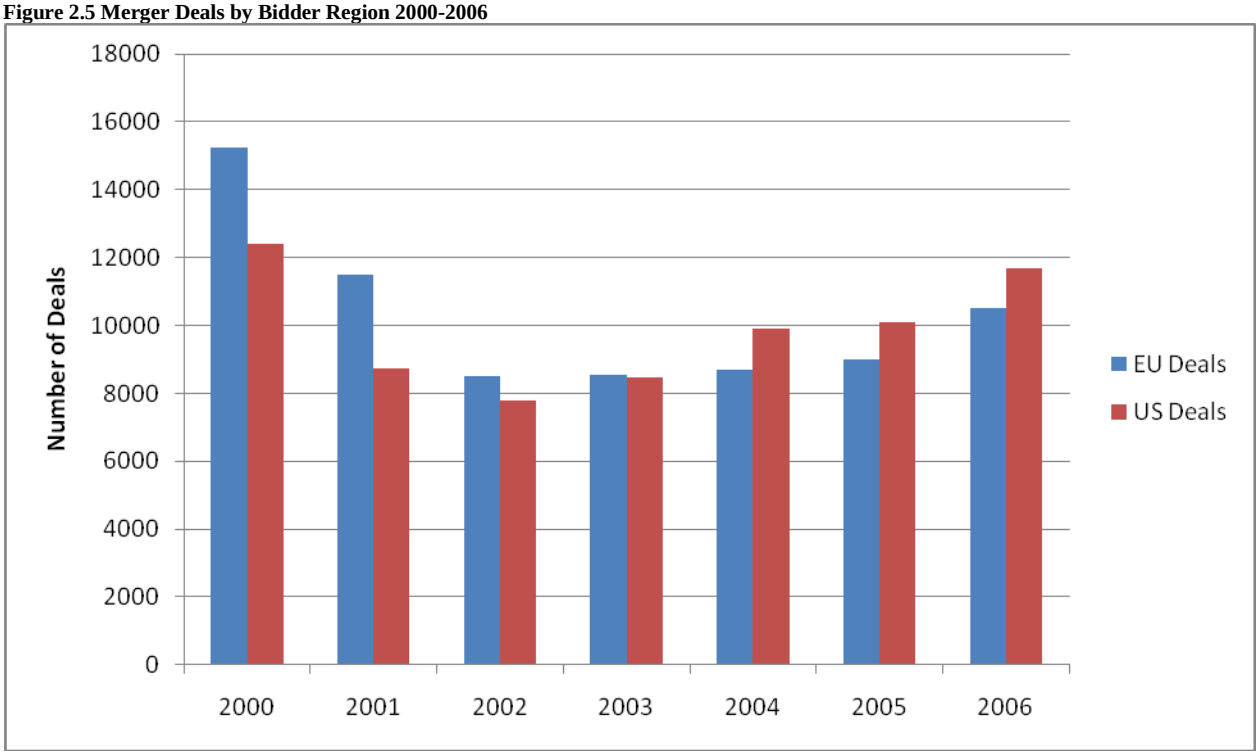
Figure 2.4 Target Banks (Transaction Values) 2005

Source: Fiordelisi (2009)

Another milestone in US legislation which was to have impact in the 2000s was the Gramm-Leach-Bliley Financial Services Modernization Act of 1999 which allowed banks to diversify by product in the universal banking model. Earlier in 1992, the Single Market Programme had formalized universal banking in Europe by legislation. The 1990s therefore ended with most restrictions in banking removed in both economic regions.

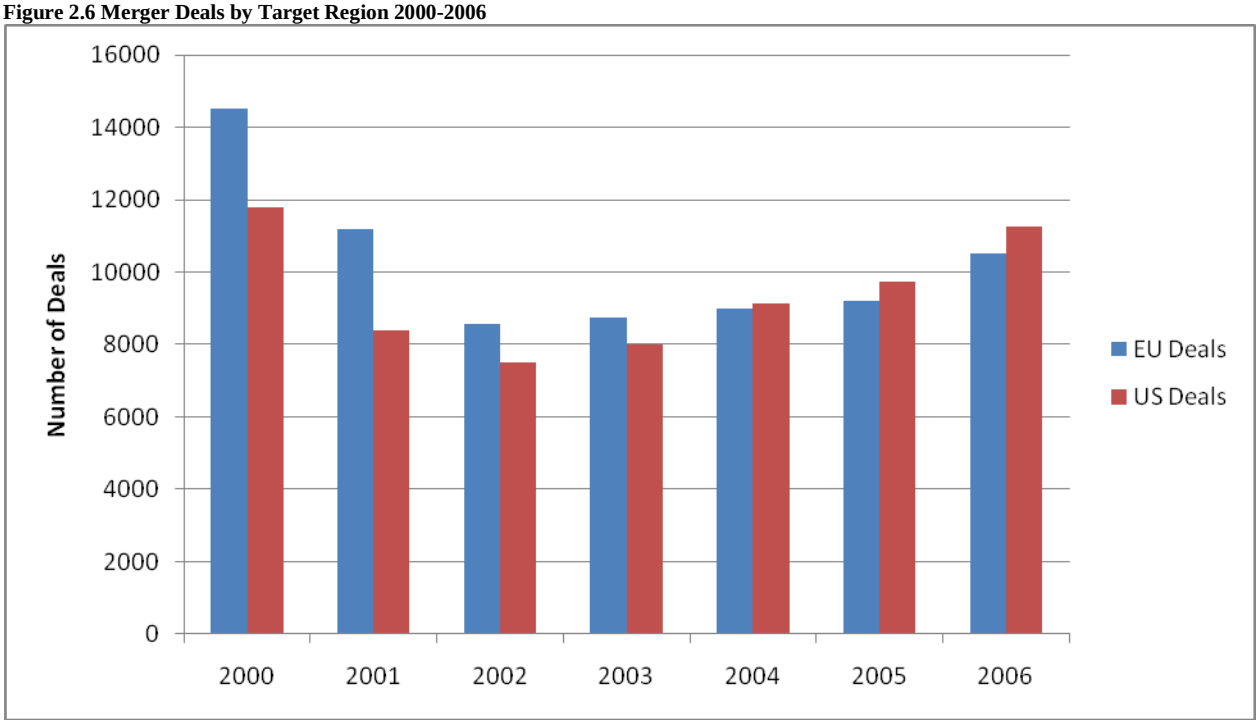
Figure 2.5 and Figure 2.6 show the number of merger deals in the US and Europe by Bidder and by Target respectively. Probably the most useful information to discern from the graphs is that for the first half of the 2001-2010 decade, annual European deals exceeded US deals, but the latter took lead in the middle of the decade.

Figure 2.5 Merger Deals by Bidder Region 2000-2006



Source: Adapted from European Commission (2007)

Figure 2.6 Merger Deals by Target Region 2000-2006



Source: Adapted from European Commission (2007)

2.2 Merger Motives

Merger motives may be grouped into Internally-driven and Externally-driven motives, but can also be classified in other ways. The European Central Bank, for example, puts merger motives into four main groups as reported below. Merger motives are also seen as either efficiency-enhancing or resource-pooling in some of the management strategy literature.

2.2.1 Internally-driven motives

It is to be expected that most merger motives would be internally-driven as discussed below.

Synergy

This is the concept that when two firms combine, the resulting institution acquires a greater value than the sum of the previous firms and this is the argument advanced most often to justify mergers. According to Rad and Van Beek (1999), synergy is achieved when the costs of the combined firm are less than the sum of those of the individual firms, attributing the reduction to economies of scale and scope. They also cite gains from reduced management inefficiencies and from reduced risk due to diversification.

Economies of Scale

Banks merge in order to benefit from economies of scale. These occur where one or more of the consolidating firms are operating at less than their optimal level. Economies of scale may be present in any part of the business including finance, marketing, management, and operations. The combined institution benefits from exploitation of those economies. Not all studies have found economies of scale in the mergers they have examined. Some early studies (Miller and Noulas, 1996; Vander Vennet, 1998) found economies only in small banks. Others like Vander Vennet (2002) and Molyneux *et al.* (1996) find economies of scale even in large European banks. Similarly, Berger and Mester (1997) find scale economies in large US banks.

Economies of Scope

For institutions in the financial services industry, these occur where through the merger the new firm is able to offer a broader range of products using the same assets the former firms owned

separately. These are cost-based economies. Revenue-based economies are realized when, using combined inputs, the same or more products than before are now distributed to a larger customer base. Economies of scope are also cited quite frequently as the reason for merger (Amel *et al*., 2004).

Market Power

A bank with market power can raise the prices of its products, losing in sales but not adversely, and can increase its sales, having to lower its prices but not adversely. The bank also has the flexibility to differentiate its products. Through the exercise of its power it can act as a barrier to entry by others, a situation that can encourage those in the market to charge unnecessarily high prices for their services. This is often a concern by regulators who are, for example, ever mindful of attempts by two of the largest banks in a market to merge, as the resulting firm then wields immense market power. A bank with a small market power may attract acquisition by a larger bank, with an intention to employ the combined assets more profitably (Moore, 1996).

Inefficient Management

The inefficient management hypothesis suggests that a firm led by an inefficient management will be taken over by another with a management that can run it more efficiently (Berger *et al*., 200b). Non-maximization of shareholders' wealth is often cited as the basis for this concept. Proponents of the hypothesis argue that, unable to change the management by other means, shareholders will seek or agree to a merger and sell off their shares at a profitable price. The counter argument is that some shareholders expecting better performance in the future, and therefore greater value for themselves, will seek to exact high enough a price from the acquirers to compensate them for the future gains they will be foregoing. This will render the acquisition unattractive to the bidders. Results from studies that have investigated the inefficient management hypothesis are mixed (Pasiouras *et al*., 2011).

There are two major theories under the Inefficient Management Hypothesis, namely, the Relative Efficiency Hypothesis and the Low Efficiency Hypothesis. The Relative Efficiency Hypothesis proposes that following acquisition of a less efficient firm, a bidder can implement value-enhancing changes including removal of the target's management. This view also suggests that

the lower the efficiency of the target the greater the potential for post-merger efficiency improvement. The Low Efficiency Hypothesis proposes improved efficiency for the merged firm if either the target or both the bidder and the target were less efficient than their industry peers. It also suggests that improvement is likely to be greater depending on the gap in inefficiency between either or both the bidder and the target and their peers (Akhavein *et al*., 1997; Berger *et al*., 1999).

Diversification of Risk

Diversification seeks to minimize credit and other risks and to reduce volatility in profits. It is achieved through merger by expanding geographically and by taking on different products or developing new ones using newly-acquired capability. Diversification is often the main driver of cross-sector conglomerates and cross-border mergers (Berger *et al*., 2000).

Agency-related Motives

Most pre-2000 literature reports that bank mergers are value-destroying. This persistent finding led to studies that sought to find out why mergers continued if they were not beneficial to shareholders. The inclination then was to conclude that mergers were motivated mostly by bidder managements to enhance their own utility at the expense of shareholders. The existence of institutions that formally or informally peg the management's compensation to the size of the organization lent credence to this suggestion. Proponents of this hypothesis believe that typically managements will pursue those goals that enhance their compensation, or status through empire-building. Such views have received recognition following studies that have shown positive correlation between firm size and executive compensation (Bliss and Rosen, 2001). Bliss and Rosen (2001) find, for example, that apart from merger-related changes being correlated to increases in compensation, those increases are implemented irrespective of any value creation or efficiency improvements. In another study, Rosen (2004) reports that the likelihood that CEOs will receive compensation increases through acquisitions, motivates them to engage more in mergers. Hughes *et al*. (2003) find that banks where managements have large shares of ownership are casual in choosing merger partners and end up with value destroying acquisitions. Also, Anderson *et al*. (2004) find that post-merger CEO compensation is correlated to anticipated merger gains as measured on announcement day. Other compensation packages are

structured to take account of post-merger productivity. A slightly different motive but which still points to managements making decisions in their own interests proposes that managements may wish to lead a "quiet life" upon achieving large size for their firm. This allows them to relax from the pressures of competition by exercising market power to maintain the firm's well-being, and avoid the anxieties of having to improve efficiency and performance (Berger and Hannan, 1998).

Evidence of negative managerial motives in Europe is rather sketchy. This is presumably because of the predominant view that early European research produced less negative merger performance results than US studies, and recent evidence that is moving increasingly toward recognition of positive gains in bank mergers. The results of Corvoisier and Gropp (2002), who examined bank mergers in ten European countries, suggest probable evidence of managements seeking the "quiet life" as increased banking sector concentration gave rise to less competition in the pricing of demand deposits. On the other hand, in their study of post-merger deposit pricing in Italy, Focarelli and Panetta (2003) find long-term increases in deposit rates, especially for efficient banks, a result which suggests the absence of managerial motives in that market.

Hubris

Sometimes managements are less careful in their decisions, particularly in times of record good performance or when the economic prospects are promising. If opportunities arise for mergers at such periods, due to over-optimism, managements may blunder as they evaluate them (Roll, 1986). They might therefore engage in mergers that turn out to be value-destroying.

2.2.2 Externally-driven Motives

In the past two decades mergers have been driven by three major factors external to the firm. These are considered below.

Deregulation

Individually, countries have done a lot to liberalize the financial services sector, and to remove barriers to greater competition. At the international level, various legislations have been passed

in order to increase competition and promote integration in Europe, and to encourage diversification across state borders in the U.S. (Berger *et al*., 1999; Group of Ten, 2001).

Technological Advances

Changes in technology have affected remarkably the way banks operate, and the speed at which they transact business across the globe, making it easier to engage in mergers. Overall, the impact of technology has been positive, with larger banks having benefited more (Goddard *et al*., 2001).

Globalization

Globalization has led to increased competition in banking (Goddard *et al*., 2001). Greater competition has in turn led to consolidation, as institutions sought to increase in size or avoid failure. With a larger size a firm benefits from economies of scale, increases in efficiency and can therefore compete better. Both deregulation and technological development have helped the globalization process.

2.2.3 The ECB on Merger Motives

According to the European Central Bank (ECB), there are four major motives for mergers in the financial services industry, as discussed below.

Improvement in Efficiency and Profitability

Some analysts believe that a merger automatically results in higher profitability. Although this is mostly the case, it is not always so. Not all mergers succeed in achieving their intended goal in the short period immediately following merger. Even when an efficient institution takes over a less efficient one the combined firm may go through a difficult period for a number of years before it attains the previous efficiency level of the bidder.

Expansion of Product Range and Client Base

This applies more to domestic mergers, with bancassurance transactions offering the typical example. Usually the insurer decides to ensure continued loyalty of existing customers and attraction of new ones by introducing bank products.

Expansion to Other Geographical Locations

For many organizations, acquiring a local business in another country is the only way of establishing business in that market. However, such deals do not always succeed. Different corporate cultures, language barriers, and environmental factors beyond the control of the new organization may lead to failure of the consolidation.

Maximization of Shareholder Value

This is often put forward in the literature as a key motivational factor for consolidation (Berger *et al*. 1999). However, there is also the view that top management are usually concerned with only the major shareholders, most of whom show little interest in the finer details of the deal, and generally avoid involvement in any decision-making. The above four motives are summarized in Table 2.1 below. It also shows the main types of mergers.

Table 2.1 Major Motives and Possible Rationalizations for 4 Types of Mergers and Acquisitions (M&As)

Source: ECB (2000)

2.2.4 Efficiency Enhancement as a Motive

Although in the literature efficiency is often taken as being embedded in synergy it is also considered by some as deserving to stand on its own as a motive for merger. It is a value-maximizing motive in mergers due to gains that can be realized through cost savings from removal of overlapping operations, streamlining of back-office functions, labour reductions, and so on. Generally, efficiency ranks high as a motive for value maximization in bank mergers, considering the potential benefits that can be derived from economies of scale and scope, risk reduction by product and geographical diversification, and taxation. Vander Vennet (1996) finds that efficiency gains can be achieved in both domestic and cross-border mergers where bidder and target are of equal size. However, some studies report that post-merger operating efficiency, profitability, and staff productivity of both bidder and target do not improve significantly relative to non-merging institutions (Berger and Humphrey, 1992; Rhoades, 1993). Brealey and Myers (2000, p. 943) suggest that it might be more beneficial to the bidder to buy another business outright than integrate it in a merger. They point out that there are firms that merge in pursuit of economies of scale but continue to operate separately and even compete. Some studies find that target banks realize positive abnormal returns upon announcement (Hawawini and Swary, 1990; Baradwaj *et al*., 1990). Focusing on cross-border mergers, some European studies find significant abnormal returns for the targets, and observe insignificant value destruction for the bidders (Rad and Van Beek, 1999; Cybo-Ottone and Murgia, 2000; Beitel and Schiereck, 2001). Economies of scale involve the issue of size, with many studies showing that larger institutions generally benefit more from economies of scale. But asset size and profitability are not associated (Heffernan, 2003, p.31).

2.2.5 Resource Pooling as a Motive

Combining special skills and resources by two partners to achieve goals common to both or specific to each one individually is a major motive of strategic alliances (Varadarajan and Cunningham, 1995). Mergers are in fact a tool for expansion and improvement of the resources

pool in order to achieve rapid growth or fast-track diversification. In banking, bidders tend to be the stronger party in corporate banking matters, while targets are more likely to be well endowed in retail banking and its usual branch network. Combining these complementary assets is consistent with the desire for promoting the universal bank concept. Post-merger challenges at the strategic level include the need to adjust continuously in order to reposition the institution, build the flexibility necessary for changing products in shortened product development lead-times, and keep with the fast pace of technology.

2.3 Merger Success Factors

Since it is generally accepted that mergers create value for targets, at least in the European Union and the US, the two regions where most investigation has been carried out, the focus of many recent studies has been to identify how value is created for bidders. Studies directed at other regions have also approached the subject with this assumption. Five categories of factors are identified in the literature as having impact on merger value creation. These are considered separately in the following discussion.

Profitability and Efficiency

Included in this category are the Relative Efficiency Hypothesis and the Low Efficiency Hypothesis. The Relative Efficiency Hypothesis states that efficiency (profit and cost) gains arise from better management skills of the bidder, which can be applied to manage the assets of the less efficient target. The hypothesis suggests that if before acquisition the bidder is more efficient than the target, it can bring the latter's efficiency up to its own level after merger (Berger *et al*., 2000b). On the other hand, the Low Efficiency Hypothesis proposes that the merger event may "wake up" the bidder's management by providing it the "excuse" for carrying out improvements that can lead to higher profitability for the combined institution. These hypotheses have been tested by some studies, including Pilloff (1996) who finds that post-event improvement in profitability and cost efficiency is positively associated with the value creation of bank merger transactions. Hawawini and Swary (1990) observe that mergers create greater value for both bidders and targets when there is a considerable gap in their efficiencies, and that the larger that gap is the greater the value which will be created. As the efficiency gap closes, value creation declines and may approach zero. In fact, some studies find that the higher efficiency of a target

has a negative influence on value creation (Houston and Ryngaert, 1994; Madura and Wiant, 1994).

It is useful to also consider the Cost to Income Ratio (CIR) which has sometimes been used to stand for cost efficiency and is still regarded by most practitioners as a standard measure of efficiency. Peek *et al*. (1999) find that the target's post-transaction profitability gains are largely influenced by the pre-transaction profitability difference between the target and the bidder, and that cost efficiency gains as measured by CIR are determined largely by the CIR difference between the firms before the transaction. Another accounting ratio commonly used when looking at cost efficiency is the Cost to Asset Ratio (CARA), while the Return on Equity (ROE) is widely used as a measure of profitability (Fritsch *et al*., 2006). Irrespective of the measure of performance used, many studies find that low cost efficiency and profitability of the target, and a large difference between the target's and the bidder's profitability and cost efficiency, are likely drivers of post-transaction excess returns for the bidder.

Relative Size

The relative asset size of the target and bidder is cited in the literature as explaining merger success. Small institutions are easier to acquire and value creation is more assured, despite the smaller scale effects (Beitel *et al*., 2004). Hawawini and Swary (1990) find that the bidder's merger success is positively associated with the bidder's relative size with the target. It is therefore generally assumed that for the bidder the merger is likely to be more successful the larger the difference in its size with that of the target.

Bidder's Experience

It is expected that the experienced bidder is better at generating post-merger synergies and therefore more likely to create value. Experience can be assessed on the basis of minority stake in the target, frequency of involvement in cross-border mergers, and other experience in a foreign country. A bidder with prior experience of the target through minority ownership is better able to value the latter through superior knowledge of its financial performance, and in a better bargaining position to avoid overpayment. DeYoung (1997) finds that the experience of

the bidder as measured by frequency of merger involvement has a positive impact. Similarly, Zollo and Leshchinkskii (2000) observe a significantly positive association between the bidder's experience and its cumulative abnormal returns. Also, Beitel *et al*. (2004), measuring experience by frequency of involvement in mergers, find that it does influence merger success significantly. On the other hand, Kaufman (1988) finds that, for those bidders with prior minority interest, the more a bidder's ownership interest increases the less the premium it pays in subsequent acquisitions. Research also shows that turning minority to majority control in emerging markets leads to successful investment (Chari *et al*., 2004). The rationale for this is that, where an institution is underperforming, the market rewards the minority owner who by majority acquisition takes the risk of turning that institution around. These and other results by previous studies have led to the hypothesis that having a minority ownership in a target prior to a merger, and therefore particular experience in the target and the country, increases the chances of the bidder realizing positive value creation upon merger announcement.

Deal-specific Factors

In this category there are a number of variables found in the literature, two of which this discussion will focus on. Ownership and method of selling the institution are important factors to consider when investigating CEE mergers, especially because of the many banks which were state-owned prior to privatization, and the auctioning of institutions that took place in the 1990s. Many banks were not yet privatized when they were acquired. Campa and Hernando (2004) find that mergers in government-controlled industries create lower value for bidders than deals in unregulated industries. This leads to the proposition that state-ownership of the target has a negative effect on merger success. As for auctioning, one argument is that the process would favour the target as there can be several bidders interested in the deal, one of whom might overpay to win the auction. Also, putting an institution through an auction may suggest that the owners are confident of the superior value of the target, since ordinarily, for a lower quality firm, they would prefer private negotiation. Investigating privatization in the CEE countries, Bonin and Wachtel (1999) contend that auctioning may expose the target to the possibility of fetching a lower price than its worth if prospective buyers are too cautious. As arguments over the issue of

auctioning are balanced, there does not seem to be a clear-cut hypothesis in the literature on how buying a bank by auction influences the bidder's excess returns.

Target-Country-specific Factors

These factors are considered in the context of developed and developing countries. Some studies find that mergers in developing countries create more bidder value than those in developed countries (Madura and Wiant, 1994; Kiymaz and Mukherjee, 2000). Cross-border mergers seem to be driven by profit opportunities that developing countries offer. Both the Gross Domestic Product (GDP) and the GDP per capita have been used as a proxy for profit opportunities (Buch, 2000). However, other researchers prefer to use the annual GDP growth rate as it reflects the prospects for future growth and reveals a country's pace of current development.

Using the target country's GDP growth rate, Kiymaz (2004) explains bidders' abnormal returns in a study of the influence of macroeconomic factors on wealth gains from cross-border mergers. His argument is that the target country's high GDP rate may influence the bidder's abnormal returns positively if prospects exist for it to gain market share and improve cash flow. He continues to suggest, on the other hand, that prospects of good economic conditions promising sufficient benefits may compel the bidder to pay an unwarranted high premium for the target. The results of his study support this alternative view. From this originates the hypothesis that in a cross-border merger involving a developed and a developing country, a high GDP growth rate in the target market will be positively associated with the bidder's wealth gains on merger announcement.

Regulation of the target market is another factor considered in the literature, with the commonly held view that foreign banks typically avoid countries with too much regulation, while where there is deregulation and privatization merger activity thrives (Buch and DeLong, 2004). These authors argue, on the other hand, that regulations can lower the efficiency of existing banks and therefore attract foreign bidders set to improve it. Where previously banks were government-controlled, the extent of market deregulation may be seen as representing progress and used as proxy for development. This reasoning leads to the hypothesis that a high level of regulation will

be positively associated with the bidder's excess returns, in line with the case of the influence of GDP growth discussed above. Regulation can be measured using as proxy indices applied for measuring economic freedom with such factors as property rights, foreign investments, fiscal burden, monetary stability, accounting standards, capital requirements, and government intervention.

2.4 Theories of Shareholder Gains in Bank Mergers

This section discusses the theories that explain where gains can be expected from. The widely-held view is that mergers and acquisitions take place with the intention of enhancing shareholder value. This can be realized in many ways in the short-term as well as in the long-term. As a result, many theories have been devised around factors that may form the source of merger gains. Lensink and Maslennikova (2008) identify four categories in which most of these factors may be grouped, as discussed below.

Theories That Predict Gains for Bidder and Target

Under this category, gains may come from operating synergy, financial economies, enhanced market power, and efficiency improvements. With operating synergies, it is assumed that economies of scale and scope exist in the financial services industry. It is assumed further that before a merger, one or both firms involved in the transaction are operating at a level which is inadequate for realizing full economies of scale. Scale economies are also realizable where vertical integration takes place, as activities at different stages of the industry's life cycle become organized under better coordinated supervision. It is possible to achieve economies of scope if the merging institutions make full use of each other's unique specializations. Operating synergies achieved usually by cost cuts have often been cited as the main motive for bank mergers and acquisitions. This has been particularly so in the past two decades, as banks responded to globalization, deregulation, and technological advances. Better management of costs became inevitable as competition increased and banks strived to remain viable. In the late 1990s for example, US banks saw cost cuts as well as economies of scope as potential sources of merger gains as they considered consolidation (Berger *et al.*, 1999; Hughes *et al.*, 1999).

Secondly, with financial economies, it is predicted that internal financing becomes cheaper overall, as the stronger cash flows of the bidder render unnecessary any external financing by the target. Also, the combined institution assumes an increased debt capacity, and this can lead to tax savings on any income generated from investments. Levy and Sarnat (1970) add that the combined firm may realize economies of scale in an issue of securities. Based on the q-ratio of the firm, it is also possible for the combined organization to realize financial synergies through the acquisition of new assets at reduced prices. The assumption here is that a more efficient firm has taken over a less efficient one, and the resulting institution is also highly efficient, to which a high q-ratio is attached. However, a low q-ratio firm can also acquire a high q-ratio one when the former wishes to improve its own management competence (Copeland *et al.,* 2003).

Thirdly, increased market power arises where, due to competitive pressures, a firm decides to engage in a merger or acquisition to diversify by product or expand geographically. This is likely to lead to substantial gains, although in some cases it could increase costs initially. Hughes *et al*. (1999) cite a diversified product portfolio and promotion of non-traditional financial services as major sources of gains for US bank mergers that took place in the 1990s.

Fourthly, with regard to efficiency, improvement is expected where a more efficient firm bids for a less efficient one. Value is created through restructuring of operations by the more efficient management. Copeland *et al*. (2003) suggest also that synergies could be achieved through better growth opportunities, leading to a critical size at which economies of scope can be utilized. This view is consistent with the evidence reported by Hughes *et al*. (1999) that economies of scope arising from multiple but related products managed by one firm provided a strong motive for bank mergers in the US in the 1990s. As for improvement in efficiency *per se*, evidence is scant. Houston *et al*. (2001), for example, report that managers engage in mergers expecting to cut costs rather than improve efficiency.

Theories That Predict Gains for the Target at Bidder's Expense

These are based on the *hubris* hypothesis. The suggestion here is that what the target gains the bidder loses so that net gains are zero. Due to *hubris* (or self-confidence), the bidder attaches the

target a higher value than the market's evaluation. This leads to an overpayment which translates into a loss for the acquirer and a profit for the target.

Theories That Predict Negative Gains

These theories relate to those mergers occasioned by a management's self-interest. As agents, managements are expected to act in the best interests of the firm's shareholders. However, in practice this is not always the case. Although with management acting in their own interests the shareholders might also benefit, this gain would be less than it could potentially have been and any loss suffered could have been avoided.

Theories that Predict Gains for Conglomerate Mergers

Conglomerate mergers are complex and of a scale that almost ensures a wide variety of gains. For example, management functions are spread over a wider range of activities in the resulting larger and diversified organization. Savings in tax and labour costs may be substantial, although Copeland *et al.* (2003) point out that these may not be the primary motives for such combinations.

2.5 Evolution of Bank Merger Performance in Europe

Europe's financial system was for many years different from that of the US where most studies on shareholder gains have been carried out. Looking briefly at how Europe's financial sector has evolved in the last two decades will help to see where gains were expected from in bank mergers in the region, and the major sources that would generate them.

Regulatory Changes

As mergers and acquisitions started in earnest in the US in the 1980s, the banking industry in Europe continued to be subject to governmental intervention (ECB, 1999). In most of EU countries for example, the industry was highly protected, and barriers existed that restricted competition to a great extent. As a result, cross-border transactions were very rare. Gardener *et al*. (2001) point out, for example, that the 1980s ended with a banking sector characterized by low concentration, overcapacity, and operating efficiency below par. Most of the protective

barriers ended following implementation of regulatory changes like the Second Banking Directive (1989), completion of the Single Market Programme (1992), establishment of the EMU (1999), and the introduction of the Euro (2002). This resulted not only in an industry structure completely different from what existed before, but also in institutions with a changed strategic outlook.

As a direct consequence of these changes, competition increased, profit margins dropped, and banks had to devise measures for improving cost efficiency. Following the introduction of the euro, traditional banking has declined, the market-based financial system is embraced more now than before, and direct market financing has increased. There is a trend towards disintermediation and securitization. Increasingly, financing services traditionally carried out by banks are now also provided by mutual funds, insurance companies, and pension funds. At the same time, banks are transforming non-marketable assets like loans into marketable securities. This has given rise to products like derivatives and other asset-backed securities. Both disintermediation and securitization have raised the pressure on banks to improve performance, innovate to increase profit, and maximize shareholder value.

The totality of changes in the European banking industry provided room for consolidation aimed primarily at increasing in size in order to improve cost efficiency. With many institutions striving to achieve this goal, it became necessary first to protect one's domestic share of the market, before moving to the next stage of growing to a size big enough for competing in Europe. Market expansion both by product and geographically have remained important motives for consolidation. It has been suggested that in the 1980s banks sought to expand in size, while in the 1990s the focus was more on gaining a share in the European market. Since the banking industry has been at different stages of development depending on the country, it follows that at any one time different banks will have a different motive for seeking to merge with another. However, the motive for increasing in size stands out as one which is ever present as long as banks smaller than others continue to exist.

It is apparent from the above discussion that merger gains can be achieved in Europe as a result of banks increasing in size.

Geographical Diversification

Financial deregulation in Europe led banks to expand geographically and utilize economies of scope. At the same time, establishment of the Single Market in the EU opened the door for banks previously protected by anti-takeover legislation to be targeted for merger. The *excess demand theory* hypothesizes that when restrictions on cross-border mergers are removed, bidders for a given target will increase, and so will the price paid. This leads to overpaying, with a long run result of underperformance in abnormal stock returns (Brewer *et al*., 2000). On the other hand, as Brewer *et al*. (2000) point out, the *barrier to entry theory* predicts a fall in prices for foreign targets when merger restrictions are removed. The reasoning here is that, while protected, the target may earn excess profits, which then disappear with entry barriers removed. Substitutability increases between target institutions, and this leads to lower merger prices. Overvaluation becomes less likely, and this may lead the market to respond by recording positive excess returns for acquirers.

In a study of geographical diversification in the US, Houston and Ryngaert (1994), and DeLong (2001), find that the market favors intrastate against interstate mergers. They attribute this to the possibility of greater cost savings for banks operating in the same economic environment. Investigating European bank consolidation for the period 1988-1997, Cybo-Ottone and Murgia (2000) observe shareholder value in domestic but not in cross-border mergers.

Lensink and Maslennikova (2008) observe that in the decade spanning the mid 1990s and the mid 2000s, the larger Northern European banks, which happen to also come from the more concentrated financial sectors, were likely to target banks in Southern Europe with greater margins. Overvaluation of targets would ensue, with negative gains to bidders. The market would also not be positive with cross-border mergers, perceiving differences in business culture and nationalistic sentiments as likely to lead to high post-merger costs. This would result in lower gains than otherwise realizable.

It is apparent from the above discussion that merger gains can be achieved by European banks involved in geographical diversification, but cross-border mergers will earn less post-event gains than similar domestic transactions.

Diversification by Product

It is important to know whether banks should merge with similar or different financial institutions. The more varied a bank's activities are the more types of risk (for example liquidity risk, off-balance-sheet risk, credit risk) it exposes itself to. Perceiving this, the market will exact a risk premium on such banks. DeLong (2001b) reports wealth-destruction for diversifying US banks, pointing out that the market evaluates each category of risk. If this is the case, the market expects a higher return from diversifying banks than from bank-to-bank mergers.

Unlike DeLong (2001b), the study by Cybo-Ottone and Murgia (2000) on European bank mergers for the period 1989-1997, reports statistically significant abnormal returns for both cross product and vertical mergers. They report that the market viewed favourably bank-insurance-company mergers which yielded an abnormal return of 7.03% on average, and this was statistically significant at the 1% level. As more non-bank financial institutions engage in traditional banking services the likelihood is that more product market diversification will take place. Customers, as well as shareholders, look positively at the availability of multiple services from a single institution. The market will in turn also perceive positively any product market diversification, resulting in merger gains.

It is apparent from the above discussion that European banks involved in product market diversification will achieve greater gains than those engaged in horizontal mergers.

Evolution in Performance Studies

Most studies on merger gains have been on US mergers and acquisitions. They have generally observed positive gains for target banks, but negative or statistically insignificant returns for bidders (Berger and Humphrey, 1997; Piloff and Santomero, 1998; Houston *et al*., 2001).

Studies on European mergers have reported results somewhat different from those reported on US mergers. DeLong (2003b) finds bidders earn 2% more than their US counterparts, while targets earn comparatively 7% less. DeLong (2003b) attributes this to the differences in the regulatory settings between the two regions. In particular, universal banks in Europe have for a long time performed a range of operations which in the US were until a decade ago restricted by law. Again, contrary to common US findings, in a study of 54 European deals, Cybo-Ottone and Murgia (2000) find significant excess returns around announcement time. They cite institutional differences between the US and European banking sectors as the likely reason for the varying results. Specifically, the more liberal regulations allowing product diversification and the more flexible anti-trust laws in Europe provide banks the opportunity to achieve economies of scope and minimize overall merger costs.

The study by Cybo-Ottone and Murgia (2000) examines two important aspects worth mentioning separately. One, they investigate whether following a merger increases in stock market value differ across countries and find they do not. They interpret this to mean cross-country effects may not be the driver of the overall merger results. This may mean that institutional frameworks are rather similar in Europe, as are stock market valuations. Two, one-third of the sample examined comprised cross-product deals of banks and other financial institutions, notably insurance companies and investment firms. They conclude that most deals in Europe involve two banks or a bank and an insurance company.

In their study of 17 European targets and 20 acquirers, Scholten and de Wit (2004) find significant excess returns for targets, but small though significant returns for bidders. Unlike the target findings which are consistent with those of earlier US studies, the bidder results support the view that, on account of the different institutional systems, Europe and US studies may report findings that are different from each other.

More recently, in an EU-15 study for the period 1985-2000, Beitel *et al*. (2004) find that target and bidder returns are not significantly influenced by whether the merger is cross-border or

domestic. In a similar study, Campa and Hernando (2006) investigating financial institutions in the EU for the period 1998-2002, fail to find significant variations in value creation between cross-border and domestic mergers. And Hagendorff *et al*. (2008), in a study of banks of the EU-15 and Switzerland for the period 1996-2004, find that bidder returns are significantly positive. This may suggest that investigating mergers that have taken place in more recent periods may yield results that differ qualitatively from those of studies of earlier periods.

2.6 The Likelihood of Being Acquired

Some studies have investigated the qualities that make a bank vulnerable to acquisition. The general assumption is that poor performers will be targeted for acquisition on the assumption that although the bank has potential to perform well it lacks the right management to make that possible. In particular, less efficient banks can be targeted for that reason and empirical studies find evidence of that in Europe (Pasiouras *et al*., 2011; Beitel *et al*., 2004). Banks may also be targeted on account of being poor performers using accounting measures of performance measurement (Koetter *et al*., 2007). In addition, banks may be targeted if they are found to be weak in credit management (Focarelli *et al*., 2002). In the US, banks found to be highly capitalized may be targeted for merger (Valkanov and Kleimeier, 2007); and, in Japan less efficient banks have been found to be targets of takeover (Hosono *et al*., 2006). Efficiency seems to be a major factor in determining merger targets even in cross-border mergers. It has been found, for example, that most firms that seek to expand abroad tend to be the large and efficient, targeting banks in countries where banks are less efficient or by nature of the financial system in the target nation banks are less efficient than they could be under a superior system like that of the bidder nation (Berger *et al*., 2000; Focarelli and Pozzolo, 2001; Buch and DeLong, 2004; Berger, 2007a).

2.7 Cross-border Bank Mergers

Due to their nature and importance to both the bidder nation and the target nation, cross-border mergers are often given special attention in the literature. This section discusses their various

aspects that deserve to be highlighted at this stage. Also, some themes that have been mentioned in earlier sections are elaborated.

Cross-border mergers in banking are a part of the on-going globalization of economic activities. Banks have been expanding by going abroad for more than a century by primarily opening branches or establishing a subsidiary. When the current wave of mergers started, it became the main mode of expansion overseas for most industries, banking included. Empirical evidence shows that banks that expand abroad are generally larger and managed better than those that do not, and come from countries widely engaged in international trade with a well developed banking sector. Large banks also tend to have large clients which they sometimes follow abroad. Focarelli and Pozzolo (2001) find a positive relationship between size and the probability that a bank operates abroad. The study also finds that highly profitable banks and those whose non-interest income forms a large proportion of their total income are also very likely to have a foreign presence. In another study, Tschoegl (2004) suggests that banks with international operations are usually the larger institutions in their home countries, and going abroad may be the result of lack of further expansion opportunities at home, in addition to antitrust restrictions. Although banks that go abroad are often among the most efficient in their home country, this does not guarantee that they will be equally efficient in the foreign country, compared to their local competitors (Berger *et al*., 2000b).

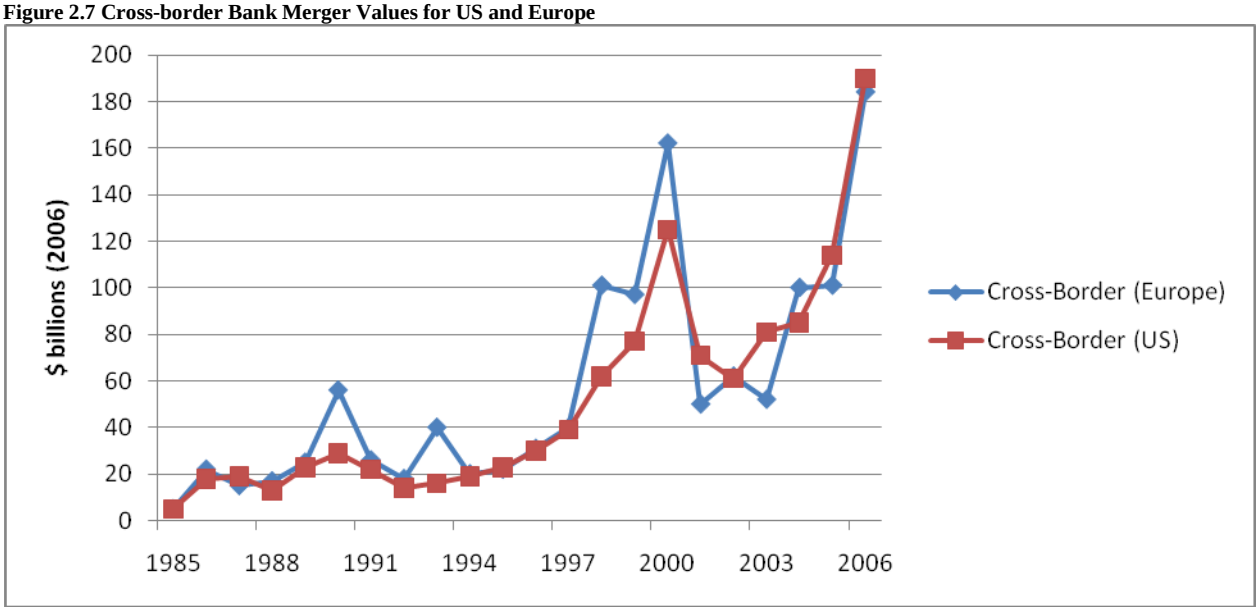
Banks, like other firms, are selective in choosing where to expand. Countries with a common language and a similar legal system stand a greater chance of having cross-border bank mergers than those without (Focarelli and Pozzolo, 2008; Buch and DeLong, 2004). Chances of having cross-border bank mergers also increase when countries share a currency area (Focarelli and Pozzolo, 2005; Allen and Song, 2005). Similarly, presence of high quality institutions in two countries increases the likelihood of cross-border bank mergers, but firms from a country with institutions of moderate quality may find that expanding to a country of a lower institutional environment works to their advantage (Claessens and van Horen, 2007). Studies that examine target countries find that banks prefer to go where competition is low, maybe because the domestic banks are not so efficient, and where the environment is bank-friendly, legal

institutions are of a high standard, bank activity disclosure requirements are high, and bank supervision is dependable (Focarelli and Pozzolo, 2005; Berger *et al*. 2004). Often, it is explicit regulatory barriers instituted primarily to discourage competition that impede cross-border bank mergers (Focarelli and Pozzolo, 2008). However, implicit government barriers may also act to restrict entry (Berger, 2007a).

Banks cannot expand abroad without enabling legislation. In the US, the Riegle-Neal Interstate Banking and Branching Efficiency Act, 1994 allowed banks to operate and acquire banks across state lines, removing restrictions that had been imposed by the McFadden Act of 1927. In Italy and Spain, similar restrictions were removed in 1992. In the US, the Gramm-Leach-Bliley Financial Services Modernization Act, 1999 removed restrictions to product diversification imposed by the Glass-Steagall Act, 1933, giving banks the freedom to operate as universal banks in the European model. Universal banking was also formally put into law in the EU in 1992 by way of the Single Market Programme. These legislations therefore allowed not only geographical but also product diversification in both economic regions. Many countries have seen substantial increases in cross-border mergers following these legislations, and considerable research has been undertaken to study their consequences. Figure 2 shows how cross-border bank merger values have been increasing over the years, comparing the US and Europe. The graph shows that there was a decline in mergers between 2001 and 2003 and that by 2006 mergers had not yet peaked.

Studies that have examined efficiency tend to find mixed results. For example, cost efficiency is not found to have improved as a result of merger in either the US (Berger *et al*., 2000b) or Europe (Vander Vennet, 2002). However, evidence is found of slight improvements in profit efficiency and in performance based on accounting measures (Vander Vennet, 2002; Elsas *et al*., 2006). In a study of diversification in the financial sector, Hayden *et al*. (2006) do not find any gains in the German banking sector. In another country-specific diversification study, Rime and Stiroh (2003) failed to find evidence of cost efficiency improvements and scale and scope economies in Swiss banks.

Figure 2.7 Cross-border Bank Merger Values for US and Europe



Source: Adapted from DeYoung *et al.* (2009)

Studies that examine stock market response to cross-border bank merger announcements generally report mixed results. In the US, Cornett *et al.* (2003) report that significant returns accrue to the bidder's shareholders in mergers that are focused both geographically and by product, but not so in diversifying mergers. The market is also found to favour focused bank mergers in DeLong (2003a). On the other hand, cross-border mergers in insurance firms and investment banks are found to yield statistically significant returns but not commercial banks (Hendershott *et al.*, 2002). US studies that have examined hypothetical bank-non-bank mergers find that cross-border and product diversifications are both beneficial (Emmons *et al.* 2004; Estrella, 2001; Lown *et al.*, 2000). In Europe, early bank merger studies found results similar to those reported in the US. For example, Beitel *et al.* (2004) find that domestic bank mergers are more value-creating than cross-border deals. However, some recent studies report exactly the opposite (Ekkayokkaya *et al.*, 2009; Lepetit *et al.*, 2004).

2.8 The Impact of Consolidation on Customers

Like every other firm, the main objective of a bank in its actions including the decision to merge, is to generate wealth for its shareholders. Sometimes, managements may ignore this objective

and pursue objectives that maximize their own utility. In either case, bank customers may suffer as a result of a decision made by a bank, like that of merger. The literature provides evidence of favourable and unfavorable merger consequences to customers as discussed below.

Research on the impact of mergers on customers is rather limited, save for recent interest in how they affect small businesses. When the current merger wave started, the perception of most customers was that mergers were useful mainly only to corporate customers, while they had a negative impact on small businesses as well as retail customers. Anecdotal evidence showed that a merger was followed by deterioration of service quality, increases in fees charged by the new bank, loss of familiar branch staff or loss of branch altogether, and the departure of clients to other banks. On the other hand, similar evidence also showed increases in loan limits, more branches sometimes, more automatic teller machines, and a general enhancement of technological services. In order to compete with the larger banks, small banks had to improve their customer service and create a local image which the local customers could identify with. As it became clear that the larger banks were not setting aside adequate funds for small business loans, the local small banks had to fill the resulting gap (Berger *et al*., 1998; Berger *et al*., 1999). Small banks were found to base their lending decisions more on lender-borrower relationships than the larger merged banks which seemed to rely more on their interpretation of accounting performance measures, as represented by financial ratios (Cole *et al*. 2004).

Anecdotal evidence also suggests that in the early mergers some banks considered retention of customers so important that they would delay implementation of cost-cutting strategies that affected customer service. Overall, merged banks did not ignore low-profile customers as it is sometimes suggested, although segmentation of those customers was necessary in order to address appropriately their different needs. The more affluent clients were found to be more concerned about the safety of their funds, availability of multiple services and products, and access to personal service and financial advice from knowledgeable and experienced staff. Less affluent customers were more interested in free services like interest-free current accounts, low interest rates on loans, and high interest rates on their deposits. The merged bank had also to

know early upon merger the demographic characteristics of its customers and their perception of how bank services should be delivered.

In a recent study, Erel (2009) finds that, on average, bank mergers are beneficial to bank borrowers as the new bank reduces interest rates. These benefits emanate from efficiency gains that the combined bank realizes post-merger which are then passed on to the bank's clients. These benefits can be passed on early if the new bank realizes efficiency gains through, for example, integration of more advanced technologies across the bank soon after merger, or diversification of risk that leads to reduction in volatility of income. Realization of scale and scope economies may help sustain interest rates that are lower than those that prevailed before merger. Some studies find that targets in a merger usually have smaller and riskier loans. And upon re-evaluation of portfolios held by the merging banks soon after merger, it is possible in some cases for the interest rate on the bidder's portfolio to go up when the portfolios are combined, but overall the loan rates are reduced and the new bank is able to provide new loans at lower rates than either bank before. Charging lower rates is particularly useful in order to expand lending to small businesses. Erel (2009) finds that, unlike earlier perception, merged banks do value to have small businesses on their portfolio.

Studying the effect of mergers in Spain, Montoriol-Garriga (2008) finds that the post-merger interest rates charged to small businesses are reduced. The study also finds that the mergers that are most beneficial to small businesses are those between large banks. The decline in interest rates is found to be small in markets with high banking concentration. Some recent research finds that in the US mergers have resulted in lower availability of loans to small borrowers (Craig and Hardee, 2007). Also, firms in need of boosting their capital find it hard to borrow from recently merged banks in the US (Carow *et al*., 2006). As merged banks behave the way they do towards small businesses, the rest of the banks in that market increase their credit to meet demand (Avery and Samolyk, 2004), and where they fall short the gap is filled by newly chartered banks (Berger *et al*., 2004). This is not the case everywhere and always, as some research finds little evidence of lending behavior differences between small and large banks (Berger *et al*., 2007). Bank mergers may also affect other products differently. As an example, Park and Pennachi (2007)

find that large banks stimulate competition in concentrated loan markets, but dampen down competition in lowly concentrated deposit markets. Some studies find that merged banks increase loan rates (Garmaise and Moskowitz, 2006; Calomiris and Pornrojnangkool, 2005; Kahn *et al*. 2000).

While most of the above studies reveal US evidence, the effects of bank mergers on customers in Europe have also been reasonably researched, with the main focus on small businesses. In their study of Italian bank mergers, di Patti and Gobbi (2007) find that for several years after merger credit availability declines. These results differ from those of Marsch *et al*. (2007) who find that credit availability to small firms is not affected by bank mergers. Investigating Belgian bank mergers, Degryse *et al*. (2006) look at what happens to bidder and target borrowers after merger, finding that the target's borrowers were the less likely to be retained by the new bank. This has to do with the observation made earlier that the target's borrowers tend to be riskier than those of the bidder. A somewhat similar study examined market response to bank merger announcements in Norway (Karceski *et al*. 2005). The study finds that the target customers' share price falls on announcement and that the fall is greater the larger the target bank. In an earlier study of Italian mergers, Sapienza (2002) finds that loan interest rates fall following mergers between small banks. However, loan rates rise when large banks in the same market merge.

2.9 Consolidation and EU Integration

Historically, it has been an objective of the European Union (EU) to develop a single financial market. As the conditions were created for a single market for financial services early in the 1990s, followed in the same decade by the introduction of the Euro, realization of that goal came closer. Integration should stimulate financial development and strong competition, leading to lower costs of financial intermediation. Ultimately, with financial integration achieved, economic growth will get a boost and productivity will increase.

One of the reasons for the delay in financial integration is that cross-border mergers have generally been slow, particularly before the Euro was launched. Although it is possible for

international banks to expand by branch network in the foreign country, experience shows that *de novo* operations are an expensive and slow way of capturing a new market. Cross-border acquisitions are therefore seen as the more likely way of developing a single market (Hernando *et al*, 2009). A recent study on cross-border mergers found that regulatory and economic barriers were the main reason for the slow progress of foreign acquisitions. Misuse of supervisory powers and political interference have been identified as two of the barriers to cross-border mergers, and could have led to much larger domestic than cross-border deals, resulting in some cases to "domestic champions" (European Commission, 2005). In response to this situation, the European Parliament and the Council issued Directive 2007/44/CE, improving procedures and evaluation standards for prudential appraisal of mergers and increases in share ownership. The directive requires, among other things, that upon reaching thresholds of 20%, 30%, and 50% share ownership be notified to the host country supervisor, and clarifies on the timings of the various stages to acquisition, including the conditions for stopping the merger.

The European Commission (2005) points out also that another barrier to cross-border mergers is the inability to pay for the deal out of reduced costs. Experience shows existence of limited scope for cost savings out of pre-merger duplicated operations. Cost savings through staff layoffs are hard to realize due to government restrictions. The experience has led Carbo-Valverde *et al*. (2007) to caution against dependence on scale for enhancing cost efficiency and achieving dominance in the EU market. Such a merger goal may only be achieved with labour market reforms which will allow institutions to reduce their staff costs and better control their input mix.

One consequence of the barriers to cross-border mergers is a reduction in the frequency of such deals, postponing the realization of an integrated market. It is also possible for it to affect the type of banks that will be targeted for merger, and the factors that potential bidders will be looking for in European cross-border deals relative to domestic acquisitions and acquisitions in other regions, including the US. Bidders, for example, might dismiss any suggestion of potential cost efficiencies and therefore abandon a merger deal they would complete only if the purchase price was less than its true valuation.

Some studies report results that are more positive about integration. For example, Ayuso and Blanco (2001) report that as consolidation picked up speed in the 1990s, European stock markets moved closer in integration. It has also been observed that there is increasing integration in inter-bank and wholesale banking but not in retail banking. The European Central Bank blames the nature of traditional banking for the slow progress in cross-border expansion of commercial banking (ECB, 2004b). Degryse and Ongena (2004) have a similar view, and caution that current technologies and regulations are inadequate for removing the obstacles still left before retail banking markets are effectively integrated. Language and distance barriers, brand, reputation, branch networks, and existence of local as opposed to national regulations, are cited by Gual (2004) as contributing to the delay in integration of the retail banking markets. According to Campa and Hernando (2006), lack of integration in the retail markets is reflected in the continued offer of some traditional products by commercial banks in some EU countries. For example, checking accounts contribute more than 50% of retail banking profits in Europe, while in the Anglo-Saxon and Nordic countries traditional products contribute less than 20% of sector profits. In the UK, asset management and related products make up 32% of bank profits, but they account for less than 15% of bank profits in France and Germany. These examples indicate that banking markets function differently across the European Union, and suggests that it may take a long time before the EU market is fully harmonized.

2.10 US and European Bank Merger Performance[11]

The majority of studies that have examined the merger phenomenon in banking have analyzed 1980s and 1990s data, most research having investigated the US industry. European research took time to take off in earnest with little done on 1980s data, but studies on 1990s and 2000s mergers have picked up speed, particularly in the past decade. Research on 1980s and 1990s transactions, especially studies investigating US deals are invariably unanimous that mergers are value-destroying. This has lent a lot of credibility to the assertion that managements engage in mergers for their own benefits and not that of their shareholders. From the beginning, European studies tended to show signs that mergers were beneficial but no definitive conclusions could be

[11] More studies than those shown in the text, and a summary of the findings of each, are listed in the appendix.

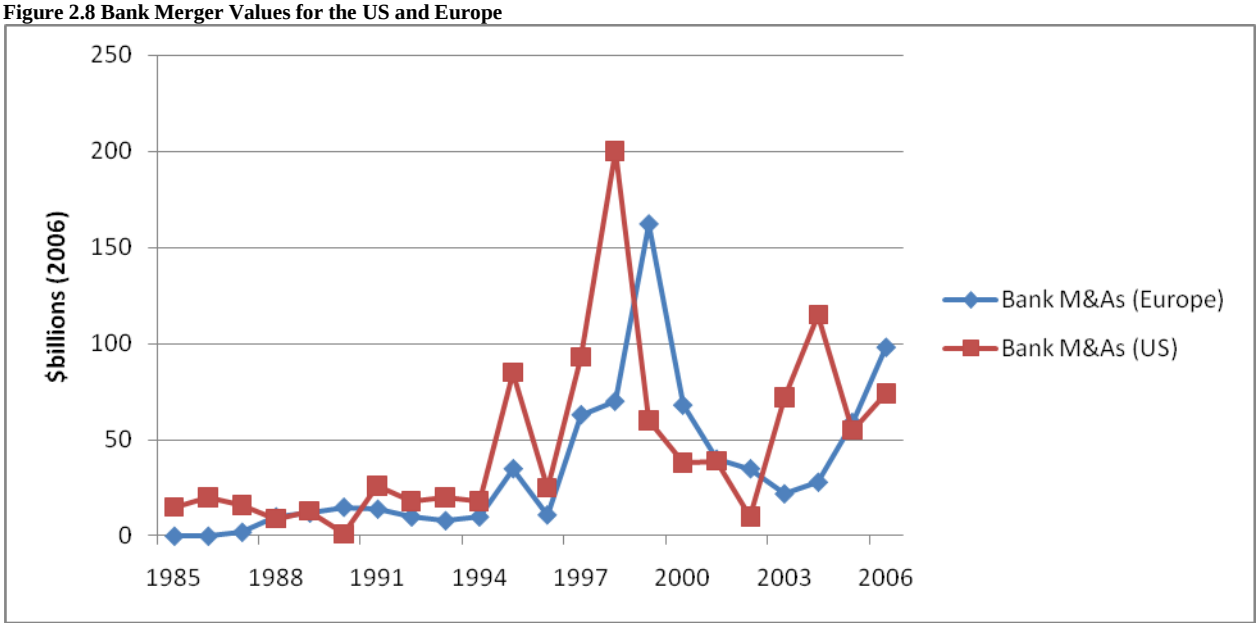
made with only limited research done in the area. The general conclusion has therefore until recently been that the results are inconclusive. Even US research has moved positively recently with signs appearing of the possibility of efficiency gains in mergers. One of the reasons for the difference in the US and European results is that the two systems were fundamentally different for many years until two key legislations were passed in the US.

In 1994 the *Riegle-Neal Interstate Bank and Branching Efficiency Act* was passed which allowed banks to operate and acquire other banks across state lines. And then in 1999 the *Gramm-Leach-Bliley Financial Modernization Act* was passed which allowed banks to operate the way universal banks had operated in Europe for many years, engaging in commercial banking, insurance, securities, and so on[12]. These two legislations have moved the US banking industry much closer to the European model. However, with respect to merger performance there still remains differences, particularly to do with how the combined firm operates after merger. It has been suggested, for example, that whereas post-merger European banks focus initially on cost-cutting to improve efficiency, US banks direct most of their effort to enhancing revenue to boost profitability (Hagendorff and Keasey, 2008). Their study finds evidence that the European strategy generates gains, although it takes some years for them to be realized, while the US strategy does not show that mergers are beneficial. Increasingly, more studies on 2000s data are finding results that point to merger benefits exceeding what was found upon studying 1990s mergers. It is possible that, as suggested by DeLong and DeYoung (2007), banks have "learnt to acquire".

While bank merger studies in general continue to focus on data that covers the past three decades, there is new interest to look more closely at post-2000 research as recent studies seem to produce results that are supportive of the view that mergers are beneficial. There is interest also in the years 1998 and 1999 when bank mergers peaked in the US and Europe and the following decline years of 2001 to 2003, as shown in Figure 2.8 below.

[12] European and U.S. legislations on consolidation in banking are presented in the Appendices 2.2 and 2.3.

Figure 2.8 Bank Merger Values for the US and Europe



Source: Adapted from DeYoung *et al.* (2009)

The following discussion reviews merger performance by looking first at the pre-2000 studies before considering how findings of post-2000 studies are changing the general perception on merger performance. Most studies have examined the reaction of the stock market to merger announcements as determined by the event study method and post-merger improvements in efficiency as measured by accounting performance ratios or frontier techniques.

Pre-2000 Abnormal Returns

The event study method is used to determine whether a merger announcement leads to a positive reaction by the market through the rising of the stock prices of the parties to the merger. A rise in the stock price above what would have been the price without the merger is said to create an abnormal return and therefore value to the shareholder. In general, a stock price is said to represent the net present value of future cash flows from that stock; hence the creation of value through an abnormal return. Most studies that have examined abnormal returns conclude for the 1980s and 1990s mergers that they give rise to positive gains for the target's shareholders but negative returns for the bidder's shareholders (DeLong, 2001a; Pilloff, 1996; Houston and Ryngaert, 1994). In many cases studies that report gains for target shareholders and negative returns for bidder shareholders report net gains are zero for the combined firm as the two cancel

each other. Some studies report positive gains to both shareholders leading to a positive gain for the combined firm (Houston *et al*., 2001; Cybo-Ottone Murgia, 2000; Brewer *et al*., 2000).

Pre-2000 Efficiency Gains

Cost efficiency is one of the most investigated merger effects as most bidders often suggest that the reason for engaging in a merger is to implement a cost saving strategy that can improve efficiency for the combined firm. Studies that have investigated both cost and profit efficiency in the 1980s and 1990s mergers generally find little evidence of efficiency improvements (Group of Ten, 2001; Berger *et al*., 1999). These results led to the suggestion that the reason mergers continued despite lack of performance improvements was because they were not being undertaken in the interest of the shareholders but in that of the management.

Post-2000 Abnormal Returns

Studies examining US evidence continue to find mixed results with regard to shareholder returns from merger announcements. Knapp *et al*. (2005) find negative gains to shareholders and post-merger reductions in profitability, non-interest income and credit quality. On the other hand, Olson and Pagano (2005) report shareholder gains, although they associate these with growth that had started before the merger. Positive gains are also reported by DeLong and DeYoung (2007), but they point out that they last for only a short while. Penas and Unal (2004) examine whether bondholders gain in merger announcements and find they do and that post-merger the cost of debt decreases.

In Europe the results are more positive than those of earlier studies. Both Cybo-Ottone and Murgia (2000) examining 54 large European mergers in the period 1989-1997 and Resti and Sciliano (2001) analyzing Italian mergers in the period 1992-1997 find positive shareholder gains on announcement. And Beitel *et al*. (2004), examining 98 large European mergers in the period 1985-2000 find positive shareholder returns. Similar results are reported by Lepetit *et al*. (2004) on examining bank-non-bank deals in European bank mergers. One of the few studies to analyze both market reaction and efficiency, Campa and Hernando (2006) investigate 244 European bank mergers in the period 1998-2002 and find announcement gains for target

shareholders but insignificant results for the bidder shareholders. They also find post-merger improvement in efficiency, and in profitability as measured by return on equity. Investigating 98 cross-border mergers involving mostly US and European banks but also some from other economic regions in the period 1985-2005, Schmautzer (2007) finds positive shareholder returns for both the targets and the bidders, with the former's gains being greater than those of the latter. Also, Ekkayokkaya *et al*. (2009) report positive shareholder returns on announcement of bank-to-bank mergers, finding further that the pre-Euro (1999) returns were larger than those that accrued to post-Euro mergers.

Post-2000 Efficiency Gains

US studies on efficiency show more promising results than the market reaction findings. Investigating bank mergers in the period 1987-2003, Knapp *et al*. (2006) find considerable profit gains that last up to five years after merger. Similarly, Cornett *et al*. (2006) find that revenue efficiency improves in large bank mergers focused by product as well as those focused geographically. In an earlier study that examined 1990s bank mergers, Kwan and Wilcox (2002) find considerable cost savings attributable to those mergers. Overall, it is the view of more than a few people that, following recent findings, US mergers can lead to efficiency gains. Yet, more studies are needed in order for the evidence to be compelling.

In Europe, there is more conviction, as a result of growing evidence, that bank mergers lead to efficiency gains. A number of European studies find post-merger performance gains in efficiency as well as profitability as measured using various ratios over time (Altunbas and Ibanez, 2008; Fritsch, 2007; Campa and Hernando, 2006; Diaz *et al*., 2004). Altunbas and Ibanez (2008) find that firms with similar strategies outperform those with different strategies in both efficiency and profitability. A similar result is found by Diaz *et al*. (2004) who report that bank-to-bank mergers perform better than bank-non-bank mergers. Some studies find that cost efficiency gains tend to appear earlier than profit efficiency improvements (Diaz *et al*., 2004; Campa and Hernando, 2006). In a study of the effects of market power De Guevara *et al*. (2005) find results from which it can be inferred that the bank mergers examined gained in efficiency also because market

power led marginal costs to fall faster than prices. In an earlier study Huizinga *et al*. (2001) find that both cost and profit efficiency improve after merger but profit efficiency gains are minimal.

Country studies in Europe also report efficiency improvements in bank mergers. In a study of 61 UK bank mergers, Ashton and Pham (2007) find efficiency improvements, as does Koetter (2005) in a study of German bank mergers that occurred in the 1990s, and De Guevara and Maudos (2007) in an investigation of Spanish bank mergers for the period 1986-2002. In another study of Spanish banks, Carbo and Humphrey (2004) examine 22 mergers for the period 1986-2000 and find improved profitability following a reduction of 0.5% in unit costs and a rise of 4% in returns.

Among the above post-2000 studies are those that also examine 1980s and 1990s data. A possible reason for finding performance improvements while earlier studies did not may be the employment of improved methods of estimating merger performance or inclusion of variables that were not considered before, or in some cases use of larger samples.

2.11 Conclusion

In this chapter, causes of the continuing wave of mergers in banking have been given and the motives of the firms that engage in them have been covered. The discussion on motives and the reasons given by banks for wishing to acquire others will help in explaining post-merger performance of mergers analyzed in this study. Aspects of consolidation that are useful in fully understanding mergers including, cross-border mergers, the effect of mergers on customers, and the special motives of management that prompt them to engage in mergers even when they may not be beneficial to shareholders are presented. Various legislations that have enabled the bank merger phenomenon both in the US and in Europe have been cited.

Another key issue also considered in this chapter is that of merger performance. The predominant ways of examining merger performance is by the event study method of measuring the stock market reaction to a merger announcement, and by investigating post-merger efficiency

performance using frontier methods, or less frequently by employing accounting ratios to determine profitability improvements. Previous studies have been cited that find evidence that on the average merger expectations were not realized in pre-2000 studies. Most research has examined banks in the US market where evidence of value-destruction by mergers is stronger than in Europe.

Post-2000 literature suggests that there is potential for efficiency improvements in the US, although shareholder value creation results by studies that examine stock market reaction are evenly split between those which find evidence of gains and those which do not. More and more European studies, on the other hand, continue to show shareholder value, efficiency, and profitability gains in bank mergers in varying degrees. It is noteworthy that some of the post-2000 studies actually investigate 1980s and 1990s data as well. A possible reason for the better results reported on those earlier periods may be the employment of improved methods of examining performance by recent studies, inclusion of variables for analysis that were not considered in earlier research, or in some cases investigation of larger samples.

The purpose of discussing merger gains and the background that led to bank consolidation in Europe was to see whether there is still a need to investigate them. We have seen that most studies on merger gains have been conducted in the US. More importantly, European studies have tended to report results that differ from those observed by US studies. Earlier we discussed the theories of merger gains, some of which suggest that gains may be realized in mergers, just as some hint that it is also possible for losses to result. Motives for mergers which were briefly covered at the beginning generally complement the merger gain theories. It is apparent from this that there is still need to investigate merger gains in Europe, and to do so this study uses the event study methodology. Gains in this case mean benefits that arise from merger announcements. But gains in general are generated from efficiency, and mergers are beneficial if they improve efficiency.

In the next chapter this study examines the effect of the market's reaction on the bidder's stock price when a merger is announced. The purpose of this step is to analyze any value creation or destruction that takes place at this stage. Efficiency performance is examined in a later chapter.

2.12 Appendix 2.1: A Summary of Bank Merger Studies

Table 2.2 Selected Bank Merger Studies (Europe)

Study	Findings
Vander Vennet (1996)	Examining the effects of mergers on the performance of financial institutions, the study finds that domestic mergers between firms of similar size increase the chances of post-merger improvement; in cross-border mergers improvement is observed in cost efficiency. Defensive tactics, management initiative, and growth of firm size, are found to drive most domestic mergers.
Cybo-Ottone, Murgia (2000)	Investigating shareholder wealth, the study finds that mergers between banks and bank acquisition of insurance firms result in positive abnormal returns. Mergers with securities firms and foreign banks generate the opposite results.
Beitel, Schiereck (2001)	This study investigates value creation in intra-sector and cross-sector mergers at domestic and international level. Target banks and the combined firm are found to gain considerably, with only minimal gains for the bidder. However results vary with the period investigated, with bidder banks posting negative abnormal returns mainly after 1998. Cross-border mergers are found to destroy value.
Cavallo, Rossi (2001)	Analyzing scale and scope economies, the study reports improvements occasioned by changes in the regulatory and technological environment. Small banks are found to seek scale and scope economies, but the larger institutions go for diversification.
Huizinga, Nellisen, Vander Vennet (2001)	In a study of efficiency, the authors find significant cost efficiency improvement but much less improvement in profit efficiency in banks. They suggest that between banks and consumers, the latter might be the greater beneficiary of bank mergers.
Vander Vennet (2002)	Focusing on cross-border transactions, the study finds that takeover of a poorly performing bank by a very efficient bidder eliminates the inefficiencies, more through improved revenue than cost efficiencies.
Berger (2003)	Targeting cross-border and cross-sector mergers, this study looks at the impact on bank efficiency of the single European market. The study finds diseconomies of scope arising from post-merger organizational challenges, while suggesting potential for revenue enhancements through diversification, installation of one-stop shopping, and improvement in branding.
Altunbas, Marques Ibanez (2008)	Interested in strategic focus, the study examines similarities in banks engaged in mergers. One major finding is that the more the similarities in cross-border mergers the more the financial returns. Also, domestic mergers tend to be costly where the partners are strongly dissimilar.
Beitel, Schiereck, Wahrenburg (2004)	The study examines stock market reaction to merger announcements, and finds that stock markets favour intra-sector mergers where also the banks operate in the same geographical area. Banks inexperienced in mergers create greater value than those with prior experience. The study suggests that the market is more interested in particular managerial goals than in creation of shareholder value.
Cummins, Weiss (2004)	With its focus on value creation in insurance firms, the study finds abnormal returns generally positive for targets and negative for bidders in domestic mergers. Cross-border mergers also are positive for targets, but value-neutral for bidders. These results suggest that international mergers are beneficial.
Goergen, Renneboog (2004)	Investigating abnormal returns, the study finds high value creation for targets but near zero values for bidders. Hostile takeovers generate even higher abnormal returns for targets and even less values for bidders. UK mergers record better results than those in other European countries. Also, cash transactions generate higher values than those settled in stocks or mixed payments. The study found that the relative size of partners in a merger or their past performances did not affect their ability to create value. Domestic mergers were found to create more value than cross-border mergers. Targets in the UK, Austria, Switzerland and Germany generated more value than those in other countries. Managerial motivation, synergy creation, and agency problems were found to drive the majority of

	European bank mergers.
Diaz, Ollala, Azofra (2004)	Analyzing intra and inter-sector mergers, finds improvement in bidder long-term profitability, especially among bank mergers. Also, bidders record the least improvement in inter-sector mergers.
Lepetit, Patry, Rous, (2004)	Examining value creation, the study finds large benefits for the targets, in both domestic and cross-border mergers. Bank- insurance mergers generate lower returns than bank-bank combinations
Ayadi, Pujals (2005)	The study investigates profitability and efficiency in both domestic and cross-border mergers. Cost efficiencies are realized in both the target and the bidder. Revenue diversification leads to profitability improvement in both domestic and cross-border mergers.
Campa, Hernando (2006)	A study investigating value creation, it finds that merger announcements generate value for target shareholders, with little effect on those of the bidder. A year after merger, abnormal returns are about zero. In general, targets have below average performance in their sector before merger. Two years after merger, targets are found to have improved significantly in efficiency.
Fricke (2007)	The study examines efficiency changes upon merger in the UK, Germany, Austria, and Switzerland. Technical and scale efficiencies improve in all countries except Germany. The study attributes the improvement to the relative size of the bidder and target, and the economic environment in the country.
Fritsch, Gleisner, Hoshauzer (2007)	Focusing on firms in Central and Eastern Europe targeted mainly by bidders from Western Europe, the study fails to find any announcement effect on the bidder's share price. Rather, bidder banks' abnormal returns seem to be dependent on the target country's GDP growth rate, regulatory regime, and the extent of economic freedom.
Lorenz, Schiereck (2007)	The research compares mergers that fail to materialize after announcement with those which are concluded. The bidder experiences negative returns, while the target banks' share price gains considerably.
Beccalli, Pascal Frantz (2009)	Considering European bidders with bank targets from all over the world, the study examines how a merger impacts several performance indicators. The study reports that the combined bank's ROE may decline, and cash flow creation may suffer. And improvement in cost efficiency is not achieved until after five to six years.
Fiordelisi (2008)	The study examines efficiency and, using an EVA model, estimates value creation in mergers in the UK, Germany, France and Italy. Efficiency is found to increase slightly in bidders over a five-year period, but it declines in targets. More value creation is found in mergers than in acquisitions.
Kohler (2008)	Investigating the effect of controls on cross-border mergers, the study finds that the economic environment of a country, transparency in the merger authorization process, and a bank's own characteristics determine the likelihood of that bank being targeted for takeover.
Ekkayokkaya, Holmes, Paudyal (2009)	This study looks at shareholder value creation following EMU and the easing of barriers to cross-border mergers. The authors report a decrease in shareholder returns, attributing this to the increased competition that ensued among market players.

Table 2.3 Selected Bank Merger Studies (US)

Study	Findings
Berger, Humphrey (1994)	Investigating efficiency, the study fails to conclude whether mergers improve efficiency or not, observing improvement in some mergers and decline in efficiency in others. The study suggests the potential for small firms to realize efficiency, as well as scale and scope economies.
Rhoades (1994)	The study considers firm performance in mergers and fails to find significant improvement therein. However, using the event study technique the author observes that mergers create value for target bank shareholders.
Peristiani (1997)	Examining post-merger performance, the study finds that the new bank does not improve on the bidder's pre-merger efficiency, although profitability increases and economies of scale are realized. Post-merger performance is found to be dependent on how well the management succeeds in using the bank's assets for quality improvement.
Siems (1996)	This is a study of mega-mergers. It finds positive returns for targets and negative ones for bidders. The market is seen to be positive on mergers, expecting them to result in improved cost efficiency, but not leading to increased market power.
Akhavein, Berger, Humphrey (1997)	Examining efficiency in mega-mergers, the study reports significant improvement in target profit efficiency, attributing it to change of strategy from investing in securities to doing so in market loans.
Berger (1998)	Investigating efficiency, this study reports benefits for banks whose pre-merger efficiency levels were considerably low. No benefits are observed for those firms that had above average efficiency levels pre-merger. Efficiency gains are attributed to a shift in investment strategy towards more customer loans and diversification of risk.
Berger, Saunders, Scalise, Udell (1998)	The research examines the effect of bank mergers on availability of credit to small firms. Results show a decline in access to credit for small and medium enterprises. However, this negative effect is mitigated by competition among banks and change of business goals by some banks upon merger.
Boyd, Graham (1998)	Focusing on small banks, this study reports cost reduction and improved efficiency for involved banks post-merger.
Rhoades (1998)	Nine different cases are reviewed to examine the impact of bank mergers on efficiency. Improvement in efficiency is found in medium-sized banks. Cost efficiency improvement is rarely observed, although cost cutting is a common feature after merger. IT integration and operational challenges pose challenges that make it difficult to realize efficiency improvements earlier envisaged.
Scott, Frame, Lastrapes (1998)	This is a study of shareholder wealth. It reports that target shareholders gained at the expense of the bidder owners upon merger. It also observes that bidder banks can improve their benefits by engaging in interstate rather than intrastate mergers and a method of payment that involves goodwill and its amortization.
Berger, Demsetz, Strahan (1999)	This is a review of 250 studies. Mergers in financial institutions are found to lead to greater market power, improved payment systems, better bank services for small and medium enterprises, diversification of risk, and improved profitability. With increased systemic risk, costs increase for the country's financial system, while the regulatory authorities create more safety tools.
Hadlock, Houston, Ryngaert (1999)	The study examines bank performance, its governance at corporate level, and management incentives. Findings show that a bank's likelihood of becoming a merger target is related to the proportion of equity that its managers hold. The less the shares they hold the greater the probability

	that the bank will be targeted for merger.
Kwan, Laderman (1999)	Value creation and performance are examined in this study. Shareholder returns are insignificant, as well as profit efficiency. This is irrespective of the high levels of efficiency in some banks pre-merger.
Berger, De Young (2000)	This is a study on cross-border and geographical expansion. Efficiency is found to be unaffected by expansion, with highly efficient banks maintaining their pre-event efficiency levels.
Brewer III, Jackson III, Jagtiani, Nguyen (2000)	This study examines shareholder value creation. Premium offered in the price for the target is found to depend on the level of the bank's capitalization and its profitability. Returns to the target are linked to its size and its share of the local market. Value gains are found to be considerably lower in large-to-large bank mergers than in mergers between banks of different sizes.
Kane (2000)	Analyzing mega-mergers, this study shows that large bank bidders gain in value when the targets are large in size and located in the same country. Such bidders seem to benefit from their "too big to fail" status which apparently the markets recognize.
Zollo, Leshchinskii (2000)	This is a study of post-merger performance in banking. To improve performance both in the short-term and the long-term, partner banks must succeed in integrating their systems. The greater the degree of integration the more assured the banks will be of improved long-term performance.
Bliss, Rosen (2001)	In this study the relationship between mergers and managers' compensation is examined. Salary levels are found to be positively associated with mergers. In general compensation, particularly of CEOs is linked to size and as mergers lead to a larger size they also give rise to greater compensation. This is in spite of any fall in the bidder price which sometimes happens upon merger. Managers whose compensation is by stock options usually have less incentive to engage in mergers.
DeLong (2001a)	This study seeks to demonstrate that markets favour mergers where the partners focus their operations on limited sources of revenue streams and restrict their geographical coverage. Greater long-term efficiency is achieved where the bidder is not so efficient initially and the method of payment for the transaction is not solely in cash.
DeLong (2001b)	In this study, a cluster of mergers with a geographical and activity focus are shown to gain greater value, while unfocused mergers destroy value. The study also finds that value creation upon merger announcement increases in relative size of target to bidder.
Hart, Apilado, (2002)	The interest of this study is to examine bank merger returns with respect to the period before and that after The Riegle-Neal Interstate Banking and Branching Act, 1994. Targets are found to gain more value than bidders after the Act, just as before. The combined firm also shows potential for creating value. Overall, mergers are found to generate greater returns after than before the Act.
DeLong(2003a)	The investigation seeks to compare long-term performance with market expectations. Due to the difficulty of predicting merger outcomes, market expectations are usually not realized. Sources and magnitudes of revenue typically impact negatively on long-term performance.
Anderson, Becher, Campbell II (2004)	The study analyzes CEO compensation post-merger, and finds that increases are linked to the higher productivity that is realized after merger, and not to the increased size of the institution as found by other studies.
Pilloff (2004)	This is a general study of US bank mergers. It found that mergers mostly involved small banks operating in proximity of the larger bidder banks. As expected, there was more merger activity in urban than in rural markets. Most targets operate in only one state and the bidder usually has at least one office in that state.
Hannan, Pilloff (2005)	The study examines the effect of capital adequacy requirements (Basel II) on bank mergers. Banks active in merger activity are found to be those which meet the regulatory capital requirements. Often they have capital exceeding those requirements, which motivates them to engage in mergers.

Mayer, Sommer, Sweeny, Walker (2005)	This is a study of three mergers undertaken by the same bank. Only one of those mergers creates value, and this is due to the substantial number of shares held in the target by its managers and employees.
Al Sharkas, Hassan, Lawrence (2008)	Analyzing post-merger performance, this study finds post-merger improvement in both operating efficiency and allocative efficiency. The combined bank operates at a lower cost than a non-merged bank as a result of access to better technology, and realizes cost savings that accrue from a better mix of production inputs.

Table 2.4 Selected Bank Merger Studies (International)

Study	Findings
Becher (2000)	The study examines shareholder value creation. It finds targets earn 20%, bidders break even, and the combined institution generates 3%.
Berger (2000)	The study compares the US and Europe on integration processes, finding considerable potential for efficiency gains, although in practice they are realized in only a few cases. Achieving revenue efficiency is found to be more common than realizing cost efficiency, the main driver being risk diversification.
Berger, De Young, Genay, Udell (2000b)	In a review of many bank studies, the study finds that domestic banks are more profit efficient than foreign banks. It also finds that in general US banks are more efficient than other countries' banks in a foreign country.
Focarelli, Pozzolo (2000)	This is a study of the bases of bank foreign expansion in OECD countries. The major finding is that the decision to go abroad is largely linked to the presence in the target country of international investors with foreign country experience, and a head office in a country where the banking sector is efficient.
Floreani, Rigamonti (2001)	Investigating mergers in the insurance industry, the study finds high bidder shareholder returns, particularly in European-non-European firm mergers. The authors also report that the higher the value of the transaction the greater the returns to bidder institutions.
Focarelli, Pozzolo (2001)	The research examines why cross-border expansion is not as common in banks as it is in other sectors. Information asymmetries are found to be one of the reasons, as well as regulatory restrictions. Size of the banks is not a factor in the decision to expand abroad. Presence of international investors in the target country encourages cross-border growth.
Houston, James, Ryngaert, (2001)	This is a long-term merger study that compares performance with management and analysts' expectations, as well as market predictions from their initial reactions. The study finds that mergers that took place in the second half of the 1990s generated cost efficiencies expected by managements.
DeLong (2003b)	Comparing the US and the rest of the world in market reactions to merger announcements, the study finds that non-US bidders earn more returns than American firms. However, US targets earn more than rest of the world targets.
Amel, Barnes, Panetta, Salleo (2004)	Examining banks, insurance firms, and asset management institutions, the study finds mergers are beneficial to small companies, but scale economies are low and managerial efficiencies minimal.

Buch, DeLong (2004)	This world-wide study of cross-border mergers finds information asymmetry to be a major obstacle to expansion. And so is the regulatory framework, though to a lesser extent and can be redressed in a short time.
Scholten, De Wit (2004)	The research considers shareholder value creation upon merger announcement for two samples, one American and the other European. In both samples, bidders suffer negative returns. Target banks earn positive returns in both cases but European targets earn less than their US counterparts. Differences between bidder and target returns in Europe are smaller than in the US.
Buch, Delong (2008)	The study investigates efficiency and risk in cross-border mergers and what drives them. Foreign banks are found to be more efficient than local ones, and systemic risk is observed, though low. There is no clear-cut conclusion on what the drivers of cross-border mergers are.
Focarelli, Pozzolo (2008)	This study analyzes cross-border mergers in banks and insurance firms. Both institutions tend to pursue a "follow the client" strategy, with the insurance firms also more concerned than banks in risk diversification. Barriers to foreign expansion affect banks more than they do insurance firms.
Williams, Liao (2008)	Considering shareholder wealth, this study focuses on emerging markets. Like in most studies target shareholders are found to earn positive returns while bidders suffer negative returns. Value is found to be linked to the target country's economic conditions, profit performance of the target, and the method of settlement used in the transaction.

Source: Adapted from Bottiglia *et al*. (2010).

2.13 Appendix 2.2: European Legislation

Table 2.5 Legislation Impacting on the EU Banking and Financial Sectors

1977	*First Banking Directive*: Removed obstacles to the provision of services and establishment of branches across the borders of EU member states, harmonized rules for bank licensing and established EU-wide supervisory arrangements.
1988	*Basel Capital Adequacy Regulation* (*Basle 1*). Minimum Capital Adequacy requirements for banks (8% ratio). Capital definitions: Tier 1 (Equity); Tier 2 (near equity). Risk-weightings based on credit risk for bank business.
1988	*Directive on Liberalization of Capital Flows.* Free cross-border capital flows, with safeguards for countries having balance of payments problems.
1989	*Second Banking Directive*. Single EU banking license. Principles of home country (home regulators have ultimate supervisory authority for the foreign activity of their banks) and mutual recognition (EU bank regulators recognize the equivalence of their regulations). Passed in conjunction with the Own Funds and Solvency Directives, incorporating capital adequacy requirements similar to Basel 1 into EU law.
1992	*Large Exposure Directive*. Bank should not commit more than 25% of their own funds to a single investment. Total resources allocated to a single investment should not exceed 800%of own funds.
1993	*Investment Services Directive*. Legislative framework for investment firms and securities markets, providing for a single passport for investment services.
1994	*Directive on Deposit Guarantee Schemes*. Minimum guaranteed investor protection in the event of bank failure.
1999	*Financial Services Action Plan* (*FSAP*). Legislative framework for the Single Market in financial services.
2000	*Consolidated Borrowing Directive*. Consolidation of previous banking regulation.
2000	*Directive on e-money*. Access by non-credit institutions to the business of e-money issuance. Harmonized rules/standards relating to payments by mobile telephone, transport cards, and Basle payment facilities.
2001	*Directive on the Reorganization and Winding-Up of Credit Institutions*. Recognition throughout the EU of reorganization measures/winding-up proceedings by the home state of a EU credit institution.
2001	*Regulation on the European Company Statute*. Standard rules for company formation throughout the EU.
2002	*Financial Conglomerates Directive*. Supervision framework for a group of financial entities engaged in cross-border activities (banking, insurance, securities).
2004	*New EU Takeover Directive*. Common framework for cross-border takeover bids.
2005-2010	*White Paper on Financial Services Policy.* Plan to implement outstanding FSAP measures, consolidation/convergence of financial services regulation and supervision.
2007	*Markets in Financial Instruments Directive*.
2007	*Capital Requirements Directives* (i.e. the Directives 2006/48/EC and 2006/49/EC) implement the "*International Convergence of Capital Measurement and Capital Standards*" (labeled as Basel II) for credit institutions and investment firms set by Basel Committee on Banking Supervision from 2008.

Source: Goddard *et al*. (2007) with own updates.

2.14 Appendix 2.3: US Legislation

d

Source: Jones and Critchfield (2005).

3

Shareholder Value Creation in Bank Mergers

3.0 Introduction

In this chapter, the aim of the study is to establish whether bidders of European commercial banks that merged in the period 2001-2007 created shareholder value. The event study methodology is used to measure abnormal gains realized by bidding firms on merger announcement. Results obtained through the analysis will be used in examining the effect of bank efficiency on shareholder returns.

Since the event study methodology is based on the market being efficient, a discussion on market efficiency is presented first before looking at evidence of shareholder wealth gains, followed by a description of the methodology itself. After considering various hypotheses, the empirical results are presented.

3.1 Information and Market Efficiency

Mergers are expected to create wealth for shareholders of the involved firms upon announcement of the proposed combination. Assuming the market is efficient, it makes a speedy assessment of a merger's performance prospects when the proposed transaction is announced. If a merger is beneficial, it is logical to expect that the moment news about it reaches the market, an instantaneous rise of stock price will take place to reflect the new information. If the market perceives the proposed merger as not being beneficial, the stock price will fall. If no change in price takes place, it may be because, following a leakage, the information is already incorporated in the price. It can also mean that due to inefficiency the market is slow to react to the news. The

market's reaction to merger news is important because it acts as the first indicator of shareholder value creation or destruction. It should be noted that the stock market reacts also to various kinds of other news about firms individually or collectively, including information on earnings, stock splits, court decisions, interest rate announcements, changes in accounting regulations, and many other economy-wide changes. This concept is based on the Efficiency Market Hypothesis (EMH) which is discussed below. According to this hypothesis, a share price reflects available information on the past, present, and future performance of a firm, depending on how efficient the market is.

3.1.1 Compounding of Information

Markets are said to be efficient if they fully and rapidly evaluate and process information and then reflect it in post-evaluation stock value. Such information could be merger news or any other relevant information. In a market for securities, available information will be fully processed and impounded into security prices. To be of value in investors' decision making processes, the information must contain something which investors do not already know. They act on such information by engaging in trading transactions through which they increase their utility. As a result of their actions, market prices are altered to reflect the impact of new information.

An important implication of the EMH is that individuals cannot achieve abnormal gains by exploiting information which is already available to the rest of the market. Due to the swiftness with which the market works, such information should already have been impounded in the security prices. One of the basic ways of modeling the evolution of security prices over time so that this condition is satisfied is through the random walk model, whereby,

$$\ln(P_{t+1}) = \ln(P_t) + \mu_{t+1}$$

$$\mu_{t+1} \sim N(0, \sigma^2)$$

i.e. the movement in the security price (in logarithmic form) between time t and time $t+1$ is given by the "white noise" random variable μ_{t+1}. In this model,

$$E\{\ln(P_{t+1}) \mid \phi_t\} = \ln(P_t)$$

where,

ϕ_t is the information set available at time t; i.e. the expected value at time t of the price at time $t+1$ is the price at time t, as the price is equally likely to move up or down. This means that knowledge of a security's current price or of the history of its price does not provide any information as to the direction in which the price will move over the next day.

According to Fama (1970), in an efficient market, prices fully reflect the information available to the market and therefore publicly available. Fama (1970) also provides the mathematical formulation of this definition, known as the "fair game" model, which is,

$$AR_{i,t+1} = r_{i,t+1} - E(r_{i,t+1} \mid \phi_t)$$

where,

$r_{i,t+1}$ = the realized return on security i in period t_{t+1} (where return is defined as the percentage change in security price adjusted for dividends received).

$E(r_{i,t+1} \mid \phi_t)$ = the expected return on security i in period $t+1$ conditional on ϕ_t.

ϕ_t = the information set assumed to be fully reflected in prices in period t, and

$AR_{i,t+1}$ = abnormal return on security i in period $t+1$.

The above expression states that the abnormal return (gain) $AR_{i,t+1}$ on security i in period $t+1$ is the actual or realized return $r_{i,t+1}$ less the expected return $E(r_{i,t+1} \mid \phi_t)$. The expected return is conditional upon ϕ_t, the information set assumed to be reflected in the security price at time t. According to Fama (1970) therefore, in an efficient market the expected value of the abnormal return (gain) is zero.

3.1.2 Efficient Market Forms

The most widely used definitions of market efficiency are the three "strength" levels suggested by Fama (1970): weak form, semi-strong form, and strong form market efficiency.

Weak Form Efficiency

A market is efficient in the weak form if a stock price reflects all information contained in its past history. No investor can therefore earn excess returns by analyzing the past behaviour of security prices. Chartists plot security price movements with the intention of using any discernible patterns for predicting future series. This exercise is futile where the weak form of market efficiency exists since past behaviour is irrelevant in predicting future price changes.

Semi-Strong Form Efficiency

A market is efficient in the semi-strong form if stock prices reflect past and present information that is publicly available. This means that no analysis or transaction carried out on the basis of publicly available information will enable an investor to earn excess returns. This form of the EMH is very relevant in the present context as publicly available information includes that which is conveyed by financial statements which we have used in one part of our analysis. After finding a market is efficient in the weak form, some studies have then proceeded to test the semi-strong form of efficiency. They have focused mainly on the speed with which prices adjust to specific events such as annual earnings announcements, stock splits, new stock issues, dividend announcements and so on. The results have generally supported the semi-strong form of the EMH, particularly with regard to the speed with which prices adjust to the first public announcement of new information.

Strong Form Efficiency

A market is efficient in the strong form if stock prices reflect all information including that which is not publicly available. Such information will sometimes be about a firm's future plans. In this case also, excess returns cannot be earned from trading based on any information, including inside information.

3.1.3 Mergers and Market Efficiency

With regard to mergers, it is expected that the announcement of the event will be kept secret until the designated day. Then, upon announcement, if the market is semi-strong form efficient, the news will be instantaneously impounded in the share price. Unfortunately, this is not what happens in practice. Sometimes word leaks out about the upcoming announcement, and depending on the speed at which such news spreads, buying and selling transactions are activated. On other occasions, people privy to information not publicly available initiate their own silent dealings, a practice usually referred to as insider trading, and illegal. In either case those activities result in abnormal returns. These are characterized by stock price levels in excess of what they would have been if leakage or insider trading had not taken place. Depending on the period that it takes for the formal announcement to be made, or full leakage to take place, and depending on the level of its efficiency, the market can take a while before it absorbs and interprets all the information and incorporates it into stock prices. Studies undertaken to test the prevailing strength of market efficiency often find that most markets are efficient in the semi-strong form.

3.2 Previous Evidence of Shareholder Value Gain

Justification for looking for shareholder gains in the mergers being investigated by this study is based mainly on what other studies have reported in the past two decades in their investigation of US and European bank mergers. The persistence of research in this area was probably moved by the conviction that there ought to be gains in bank mergers based on the theories that were covered in Chapter Two, even with so many earlier studies finding results to the contrary. With recent studies increasingly indicating the existence of gains, at least in European bank mergers, more and not less research is necessary in order for consensus to be reached that for now at least and with respect to a particular period bank mergers produced the desired results consistent with theory.

Stock market reaction to a merger announcement is an indicator of market efficiency as it summarizes the market's perception of the combined firm's future performance. Most studies that have examined this phenomenon using data from the 1980s report that merger targets gain

on announcement while bidders lose. As a result, some studies conclude that there is no overall benefit to the merging partners since what one gains is offset by what the other loses, effectively portraying it as a transfer of wealth from the bidder's shareholders to the target's shareholders. The 1990s data yield results that show improvement in merger returns for both bidder's and target's shareholders. This may be attributed to a number of reasons including "learning" how to execute mergers from the 1980s deals. It is also possible that, since most of the 1990s deals were settled using cash as opposed to the use of stocks done in the 1980s, the market reacted more favorably to the latter decade's mergers. Houston and Ryngaert (1997) find higher returns for bidders in cash-financed mergers than in stock-financed deals. In an earlier study, Houston and Ryngaert (1994) find greater merger gains when the bidder is considerably more profitable than the target. This is consistent with the hypothesis that banks target less efficient firms in order to improve their management and therefore increase shareholder value. The study also finds that gains are even greater when there is a substantial overlap of operations between the merging banks, which then boosts the combined bank's share of the market. This is supportive of the hypothesis that a large market share generates higher profits.

Another aspect of market reaction that has been investigated is diversification, and the results are mixed. Cornet *et al*. (2003), for example, fail to find abnormal returns in bidder banks engaged in focusing acquisitions, while reporting negative returns in those pursuing diversification. DeLong (2001b) reports evidence of value creation in geographical and product focusing mergers, but also fails to find evidence of gains in diversifying deals. Prior to these studies, Zhang (1995) found geographical diversification value creating on account of low variability of income, and also in cross-market mergers. Mention was made above of gains that can accrue from an increased market share. This perhaps is only possible before the market is too concentrated. Higher market power confers on a bank the ability to charge higher prices for its services which should lead to increased profits. It has been observed, however, that firms may decline in efficiency in highly concentrated markets. A fall in efficiency will diminish gains generated by market power, thereby failing to raise the bank's market value (Berger and Hannan, 1998).

In a nutshell, most research on post-merger performance in both Europe and the US, where the overwhelming number of studies was undertaken, show that consolidation is largely value-destroying, especially for the bidder's shareholders in whose name the merger was undertaken in the first place. Studies have consistently shown that the target's shareholders gain the most in any merger. Many studies show that initially mergers did not result in any improvements in operational performance, nor were there efficiency gains, contrary to what was generally claimed to be the motives behind the merger decision. Some studies undertaken up to around 2000 report that mergers are value-enhancing while others report otherwise, and most reviewers fail to reach a definitive conclusion that mergers are value-enhancing. There are studies that conclude that in recent years the situation has changed slightly, as more and more studies are reporting shareholder wealth gains and operational and efficiency improvements in both the short-term and the long-term after merger.

Table 3.1 Selected Bank Merger Event Studies

Study	Study Period	Country	Event Window	Sample Size	Bidder Wealth Effects	Target Wealth Effects
Ekkayokkaya *et al*. (2009)	1990-2004	EU	-1,+1	963,963	+	n.a.
DeLong and DeYoung (2007)	1987-1999	USA	-10,+1	216,216	-	+
Gupta and Lalatendu (2007)	1981-2004	USA	-1,+1	503,503	-	+
Caruso and Palmucci (2005)	1994-2003	Italy	-30,0	21,21	-	+
DaSilva and Diz (2005)	1995-2003	Portugal	-20, +20	30,30	0	+
Akhigbe *et al*. (2004)	1986-2000	USA	-1,0	28,0	0	n.a.
Beitel *et al*. (2004)	1985-2000	Europe	-1,+1	56,56	0	0
Kiymaz (2004)	1989-1999	USA	-1,+1	207,70	+	+
Henock (2004)	1993-1999	USA	-1,0	227,0	-	n.a.
Lepetit *et al*. (2004)	1991-2001	Europe	-7,+7	151,29	+	+
DeLong (2003)	1991-1995	USA	-10,+1	54,54	-	+
DeLong (2001)	1988-1995	USA	-10,+1	280	-	+
Becher (2000)	1980-1997	USA	0,+1	558,558	0	+
Kane (2000)	1991-1998	USA	0	110,110	-	+
Resti (2001)	1992-1997	Italy	-120,+250	12,12	+	0
Brewer *et al*. (2000)	1990-1998	USA	0, +1	0, 327	n.a	+
Tourani-Rad et al. (1999)	1989-1996	Europe	-40,+40	56,17	+	+
Wang (1999)	1990-1997	USA	-1,+4	177,177	-	+
Bannerjee and Cooperman (1998)	1990-1995	USA	-50,0	30,62	-	+
Houston and Ryngaert (1997)	1985-1992	USA	-1,+1	209,0	-	n.a.
Subrahmanyam *et al*. (1997)	1982-1987	USA	-1,+1	263,0	-	n.a.
Siems (1996)	1995	USA	-1,+1	19,19	-	+
Zhang (1995)	1980-1990	USA	-5,+5	107,107	0	+
Houston and Ryngaert (1994)	1985-1991	USA	-230,+31	153,153	-	+
Palia (1994)	1984-1987	USA	-5,+5	48,0	-	n.a.
Baradwaj *et al*. (1990)	1980-1987	USA	-5,+5	53,53	-	+
Bertin *et al*. (1989)	1982-1987	USA	-20,+20	33,0	0	n.a.

Note: n.a. = not analyzed.

Table 3.1 presents a summary of studies that have investigated shareholder value creation in US and European bank mergers.

3.3 Methodology and Data

3.3.1 Event Study

Event studies are undertaken to establish whether, following an event, shareholder wealth is created. For mergers, shareholder returns are the first indicator of the likelihood of improvement or otherwise of the performance of a firm involved in the proposed deal.

The event study methodology has been used by various studies to investigate whether bank mergers create value upon announcement[13]. It involves following of the standard procedure explained below.

The Event Date

Deciding the event date, which is the day the market first learns of the proposed merger. Ideally, it should be the day the merger is publicly announced. However, sometimes firms disclose their intentions before a formal agreement. By the time a formal announcement is made the market will have already adjusted prices in anticipation of the impending deal. Due to uncertainty about when exactly the market learnt of the impending merger, this study uses the announcement date, while aware that for some of the mergers news could have reached the market before that date.

The Event Window

Determining the event window - this is a period around the event date, starting some time before and ending some time after the event. Researchers have not set a standard for this period. For the sake of focus and in line with many other studies, this study chose eleven days, from five days before to five days after the announcement day. A recent example of a study that has used an

[13] Two of the early European studies are Cybo-Ottone and Murgia (2000) and Beitel and Schiereck (2001).

eleven-day window is Chronopolous *et al*. (2010). Also, three recent studies have examined the eleven-day window in addition to other windows, namely, Lensink and Maslennikova (2008), Becher (2000), and Cybo-Ottone and Murgia (2000). Earlier studies that have used an eleven-day window include Smith and Kim (1994), Berkovitch and Narayan (1993), Kaplan and Weisbach (1992), and Healy *et al*., (1992).

The Estimation Period

Establishing the estimation period - this is usually the period before the event used to investigate how the stock behaved before the market's knowledge of the merger. In this case also, no standard period has been agreed. This study avoids a period which is too short, for fear of losing essential information, and one which is too long, for fear of including a period when the firm might have had a substantially different character. An estimation period of 100 days is used, from 105 days before to 6 days before the event day. It is possible to use a post-event estimation period but studies that do so are very rare.

The Sample

Selecting the firms to be examined - a sample of 56 mergers was selected for this study, comprising only European commercial banks.

Normal Returns

Calculating normal returns (not associated with the event) - these are measured from the performance of the stock prior to the event window. In this study, the estimation period used in the calculation of normal returns was 100 days.

Abnormal Returns

Ascertaining abnormal returns - these are determined as the difference between the actual return of a stock and its expected return.

Cumulative Abnormal Returns (CARs)

Aggregating abnormal returns - cumulative abnormal returns are the sum of abnormal returns from one date to another, and they are calculated for all the days in the event window, and for smaller windows within the main window.

Statistical Significance

Testing for statistical significance - the aim of these tests is to determine the statistical significance of the abnormal and cumulative abnormal returns for use in drawing inferences.

3.3.2 Measurement of Normal Returns

As stated above, to be able to determine abnormal returns, the expected returns must first be known. Various methods have been used for that purpose, the most common of which are discussed below.

The Mean Adjusted Return Model

This is a simple method which assumes that a stock's mean return over the event window is the same as the mean return over the estimation period. It therefore makes the expected return during the event window to be equal to the mean return over the estimation period. Abnormal returns are the difference between this expected return for each day in the event window and the actual return.

One of this method's shortcomings arises where firms in the sample under study have event dates that are very close to each other, a phenomenon referred to as event clustering. The method can also be unsuitable for use in a bull market or a bear market situation. In either case expected return estimates over the event window would be biased, upwardly in the former, and downwardly in the latter.

The Market Adjusted Return Model

In this approach, the stock's mean return over the event window is assumed to be the same as the market return over the same period. Without an estimation period, abnormal returns are the difference between the actual return and the expected return, in this case the daily market return.

Absence of estimation period, and the attendant modeling of expected returns, is considered advantageous. The method, however, has the disadvantages associated with event clustering, just like the Mean Return method.

The Capital Asset Pricing Model (CAPM)

The CAPM is a one-period model that is credited to Sharpe (1964), Lintner (1965), and Mossin (1966). Its main idea is that, based on unlimited borrowing and lending at the risk-free rate of return in a perfect capital market, the expected return $E(R_{it})$ is given as:

$$E(R_{it}) = R_{ft} + \beta_i (R_{mt} - R_{ft})$$

where,

$E(R_{it})$ is the expected return i in time t,

R_{ft} is the risk-free rate of borrowing and lending in time t,

R_{mt} is the return on the market index in time t,

β_i is the systematic risk of security i relative to the market.

The Market Model

This most widely used model is also used in this study, and is based on a linear relationship between the expected return of a share and the market return. A notable study that has used it on European data is Cybo-Ottone and Murgia (2000). It is given as,

$$E(R_{it}) = \alpha_i + \beta_i R_{mt}$$

where,

$E(R_{it})$ is the expected return of security i in time t

R_{mt} is the benchmark market index in time t

α is the intercept term derived in OLS regression over the estimation period.

β_i is the slope coefficient associated with the market return derived in OLS regression over the estimation period.

The market model is often compared to other models which are not so widely used like the Arbitrage Pricing Theory (APT) of Ross (1976), and the three-factor model of Fama and French (1993) (FF). Both the APT and the FF, like the CAPM, are asset-pricing models. They differ from the other models mainly because they explain a stock's expected return as a linear combination of several factors. This is considered their main advantage over the market model. It has been argued also that using asset-pricing models makes it possible for more precise expected returns to be measured, by imposing economics-based restrictions over and above those imposed in statistical models like the market model.

The market model, being a one-factor model, is prone to omitted variable bias. This is the effect an omitted variable might have on regression results. In particular, the general assumption that the mean of the error term is zero will be violated, unless the effect of the omitted variable on the dependent variable would be zero if included in the regression model. Since the constant term is also influenced by the means of the explanatory variables, an omission of one will bias it. And, where the omitted variable is correlated with the other explanatory variables, regression may generate coefficients of the latter that include the effect of the missing variable.

It is generally assumed following many actual and simulated studies that the omitted variable bias does not lead to serious effects on regression results when the market model is used. In fact, additional explanatory variables applied in the measurement of abnormal returns, are often found to have minimal explanatory power, leading to the popularity of the statistical models (MacKinlay, 1997). Most event studies that have used statistical models have found them to be quite suitable for measuring abnormal returns (Brown and Warner, 1985; Armitage, 1995).

3.3.3 Weaknesses of the Event Study Methodology

Despite widespread use and recognition as the best method for measurement of value creation triggered by corporate news, event study is often associated with the weaknesses discussed below.

Use of the event study methodology requires various assumptions to be made about the stock market, some of which might not hold in some markets – for example, the market should be semi-strong efficient, all market participants make rational decisions, and arbitrage happen without any restrictions. Also, the methodology suffers from the adverse outcomes of confounding effects, sometimes leading to skewed returns for some firms, particularly where the sample size is small. In addition, as already discussed above, different models are used for measuring abnormal returns, particularly the market model, and the market adjusted return, the mean adjusted return, and the capital asset pricing models. As a result, findings of different studies cannot be standardized for comparison purposes.

Information on which investors base their reaction to news released by a firm's management about the firm's future plans is often less than the full information that is held by the management, and shareholders have to rely on the former's good intentions and achievability of its future expectations. A reaction can therefore be more or less negative or positive than it should be due to the information asymmetries inherent in the relationship between those who have access to all the information and those who have only partial access. Furthermore, the concept that the stock price reflects the net present value of all future cash flows, in other words yet to be received benefits, can at best provide estimates that are predicated on the totality of optimism (or pessimism) about future performance.

Event study is only useful for those firms that are publicly listed on an active stock exchange. In countries where the capital markets are not well-developed it is not very useful, and it does not work for the many institutions that are not listed on a stock exchange in advanced capital markets. To this extent, the methodology is of very limited use. It is of course also too dependent on the accuracy of both stock prices and the actual time news of interest reached the market.

Separating out the effects on the stock price of information other than the news of interest may also be very challenging. Since the methodology is only for publicly traded shares, most studies are able to use only small samples, which in addition are not randomly drawn, and whose results therefore cannot be generalized.

Another area where event study has attracted criticism is the absence of an agreed estimation period and even a standard event window. Since different researchers use different estimation periods, decide own event windows, and sample sizes differ from one study to another, even in studies undertaken in the same country, it is often difficult to compare results objectively. In addition, there is also the choice of method for estimating normal returns, and the decision on how to test the statistical significance of results obtained.

The above issues refer mainly to the use of the event study methodology for measuring abnormal returns in the short-term. Its use in estimating abnormal returns in long-term post-event windows is more complex and prone to the adverse effects of confounding effects caused by events other than that of interest. Also, event clustering is difficult to avoid in a long window which in banking is considered to be around three years post-event (Rhoades, 1994). Due to these and other problems associated with long-term event studies, considerable methodological adjustments are normally required in order to arrive at meaningful results. There are only a handful of studies which, in addition to measuring short-term abnormal returns, have also looked at long-term abnormal returns. These include Schmautzer (2006), Cybo-Ottone and Murgia (2000), Beitel *et al*. (2001), and Campa and Hernando (2006).

3.3.4 Sample Selection

For this study, relevant data on bank mergers that took place between 2001 and 2007 were obtained from the Reuters Database and from the Acquisitions Monthly[14] magazine. The magazine was particularly useful for providing the method of payment used in every merger.

[14] Acquisitions Monthly (www.aqm-e.com) is published by Thomson Reuters (ISSN 0952-3618).

Stock prices were obtained from Yahoo Finance (uk.finance.yahoo.com, 2009). The Bankscope Database provided financial statement data on the firms selected.

Mergers included in the sample had to meet the following criteria:
(i) The merger was announced between 1st January, 2001 and 31st December, 2007 and both bidder and target were commercial banks headquartered in one of the EU countries, Sweden, Norway, Switzerland, or the three countries aspiring for EU membership, namely, Croatia, Turkey, and the Former Yugoslavia Republic of Montenegro (FYROM).

(ii) Merger is defined as occurring when the bidder acquires more than 50% holding of equity, which may be all at once or at the instance this threshold is reached following previous acquisitions in the target.

(ii) The bidder was listed on a stock exchange, but not necessarily so for the target.

(iii) Only bidders and targets whose income statement and balance sheet data were available for at least one year before the merger were selected.

Starting with an original list of 102 mergers the list was reduced to only 56 (55%) mergers after eliminating institutions that failed to meet one or more of the above criteria.

Summary characteristics of the sample chosen for this study are shown in Tables 3.2 and 3.3.

Table 3.2: Summary A of Sample Characteristics

				Average Total Assets (Million $)			
Year	Number of Mergers			X-border		Domestic	
	Total	X-border	Domestic	Bidder	Target	Bidder	Target
2001	6	2	4	181,795	97,151	107,456	27,313
2002	6	2	4	116,744	1,046	190,289	51,421
2003	8	5	3	385,837	6,438	138,651	3,234
2004	7	5	2	394,867	66,145	165,670	17,853
2005	9	6	3	394,662	117,377	95,610	8,202
2006	14	11	3	672,797	18,843	256,046	60,275
2007	6	3	3	509,385	73,001	477,644	93,422
Total	56	34	22	-	-	-	-

Note: X-border = Cross-border

Table 3.2 shows that cross-border bidders are more than a dozen times larger than their targets, when the outliers are excluded. Domestic bidders are just a bit less than a dozen times larger than their targets. And cross-border bidders are around three times as large as domestic bidders, while cross-border targets are three and a half times as large as domestic targets. With bidders so overwhelmingly larger than targets it is expected that post-merger integration will not pose much difficulty to the combined firm. On the other hand, it may mean that the merger may not have much impact in the market.

Table 3.3, which presents the descriptive statistics, shows that overall domestic mergers were paid for in larger amounts than cross-border mergers. This may also be a reflection of the disparity in size between cross-border bidders and their targets.

Table 3.3: Summary B of Sample Characteristics

				Deal Values (Thousands $)					
Year				Cross-border			Domestic		
	Total	X-border	Domestic	Mean	Minimum	Maximum	Mean	Minimum	Maximum
2001	6	2	4	411,940	350,000	473,880	2,038,893	73,280	4,124,500
2002	6	2	4	119,195	64,040	174,350	5,269,313	87,158	16,760,570
2003	8	5	3	508,297	128,840	1,298,450	392,287	49,980	1,298,450
2004	7	5	2	3,675,861	132,696	15,925,069	123,555	109,100	138,010
2005	9	6	3	4,498,561	65,189	18,256,500	793,140	68,216	2,157,210
2006	14	11	3	2,046,917	171,587	5,644,700	15,223,256	11,297	37,624,240
2007	6	3	3	5,664,955	279,923	16,297,487	14,326,631	264,780	29,503,133
Total	56	34	22	-	-	-	-	-	-

This study aimed to include in the sample firms from as many as possible of the European countries i.e. EU countries plus Norway, Sweden, Switzerland, and three countries aspiring to join the EU, namely Croatia, Turkey, and the Former Yugoslavia Republic of Montenegro (FYROM). The selection criteria outlined above eliminated most firms from most of the countries. As a result, the sample has only bidder firms from twelve Western European countries, while target firms come from both the Western European and the Central and Eastern European regions. Table 3.4 shows how the mergers are distributed among the various countries of the two regions.

Table 3.4: Distribution of Mergers by Country

	Target Nation																		
Bidder Nation	AT	BG	CR	CZ	FL	FR	DE	GR	HU	IE	IT	PL	PT	RO	SL	ES	TR	UK	Total
Austria				2										1	1				4
Belgium		2															2		4
Denmark					1					1									2
France			1			2	1	2			3								9
Germany							2					1							3
Greece		2						1									1		4
Italy	1			1			1		1		13	1			1				19
Holland							1				1								2
Portugal												1	1						2
Spain																2		1	3
Sweden												2							2
UK																1	1		2
Total	1	4	1	3	1	2	5	3	1	1	17	5	1	1	2	3	4	1	56

Note: AT=Austria; BG=Bulgaria; CR=Croatia; CZ=Czech Republic; FL=Finland; FR=France; DE=Germany; GR=Greece; HU= Hungary; IE=Ireland; IT=Italy; PL=Poland; PT=Portugal; RO=Romania; SL=Slovakia; ES=Spain; TR=Turkey; UK=United Kingdom

3.3.5 Calculation of Stock Return and Market Return

Having obtained the daily closing stock prices of each firm the return was calculated by taking the natural $\log(LN)$ of a day's price P_t and dividing it by the previous day's price P_{t-1}, in the form,

$$\text{Return} = LN(P_t / P_{t-1}) \qquad \text{(E1)}$$

The above process is repeated for the market returns, so that in the end there is a stock return and a market return for every day of the estimation period for each firm.

Intercept α and Coefficient β

These were estimated through OLS regression over the estimation period of 100 days.

Abnormal Returns (ARS)

Using the market model parameters already estimated, abnormal return is obtained from:

$AR_{it} = R_{it} - E(R_{it})$

where,

R_{it} is the actual return of stock i in time t, and

$E(R_{it})$ is the expected return.

As discussed earlier, the abnormal return is expected to be zero, and the hypothesis to be tested is of the form,

$H_o : E(AR_{it}) = 0$.

Standardized Abnormal Returns (*SARS*)

In many samples there might be stocks whose prices are more volatile than others. When the abnormal returns are aggregated for all stocks and their average calculated, the resulting average abnormal returns (*AARS*) will be affected, which may lower the power of any test of significance. This is the reason for standardizing the abnormal returns.

According to Dodd & Warner (1983), standardized abnormal returns are calculated from the formula,

$$SAR_{it} = \frac{AR_{it}}{\sqrt{s^2_{AR_{it}}}} \qquad \text{(E2)}$$

where,

SAR_{it} = SAR for firm i at time t

AR_{it} = AR for firm i at time t

$s^2_{AR_{it}}$ = variance of AR for firm i at time t

$\sqrt{s^2_{AR_{it}}} = s_{AR_{it}}$ = standard deviation of AR for firm i at time t

Cumulative Abnormal Returns (*CARS*)

Abnormal returns for individual days are important in event study. However, to capture the total impact of the event on firm performance, the abnormal returns are aggregated over the number of days in the event window. The returns may also be aggregated for only some of the days in the event window. For example, abnormal returns may be aggregated for the days within the event window before announcement to detect any leakage. Aggregation of returns after the event day will capture the market's reaction after announcement. Cumulative abnormal returns are calculated from,

$CAR_{it} = \sum_{t_1}^{t_2} AR_{it}$ for the event window (t_1, t_2)

From the hypothesis that expected AR is zero, then expected CAR too is zero.

Average Standardized Abnormal Returns ($ASARS$)

These are calculated from,

$ASAR_{it} = \left(\frac{1}{N}\right)\sum_{i=1}^{N} SAR_{it}$ where N is the number of stocks in the sample.

Average standardized cumulative abnormal returns ($ASCARS$) are obtained similarly.

Test of Significance

The test of significance is given by:

$Z = \sqrt{N} * ASAR_t = \sqrt{N} * \left(\frac{1}{N}\right)\sum_{i=1}^{N} SAR_{it}$ with all the symbols defined as before, based on the assumption that the abnormal returns are normally distributed.

3.4 Hypotheses of Interest

The study seeks to establish whether merger announcements in the period 2001-2007 gave rise to shareholder value gain. This is determined by finding out whether on or around the announcement date stock prices of firms involved in the transaction reacted positively or

negatively to the news. A change in price in excess of or below what was expected taking into account previous performance, would be interpreted as having been caused by the announcement. A few theoretical concepts on which hypotheses are based are discussed before reporting the results.

3.4.1 Geographical Diversification

By extending operations overseas a bank is able to reduce risk, serve a larger and probably different market, as well as exploit the advantages of a different regulatory regime. However, many studies show that cross-border mergers create less shareholder wealth than domestic deals. Markets tend to perceive domestic mergers as being the more likely than cross-border deals to implement planned cost savings, particularly those pertaining to employees, due to laws existing in many countries that make it difficult to downsize the workforce. Valuing foreign firms for merger purposes is more prone to error due to information asymmetries. In theory therefore, the expectation is that domestic mergers will create more shareholder wealth than cross-border mergers. This is based mainly on findings of earlier US studies where most research has been done on the topic (Houston and Ryngaert, 1997; DeLong, 2001b). The findings of early European studies also support this view (Cybo-Ottone and Murgia, 2000). However, results reported by recent studies comparing cross-border and domestic wealth creation upon announcement are mixed. Beitel *et al*. (2004), for example, report more wealth creation in domestic than in cross-border European bank mergers, like earlier studies. However, there are other recent studies that find that cross-border mergers create more shareholder wealth than domestic deals (Lepetit *et al*., 2004; Buch and DeLong, 2004; Ekkayokkaya *et al*., 2009).

The above discussion leads to the following hypothesis:

Hypothesis 1: Domestic mergers create more shareholder value than cross-border mergers.

3.4.2 Method of Payment in Bank Mergers

The method of payment in a merger transaction may convey information to the market that can lead it to react accordingly. The bidder's management therefore takes great care in deciding on how to settle the deal, whether by offering stocks or paying cash. The management acts in its shareholders' interest by choosing to pay cash if it believes its firm is undervalued by the market. It also acts in their interest by offering stock if it believes their firm is overvalued. The bidder's shareholders will therefore react negatively to news of payment by equity in a merger transaction, causing a fall in share price (Myers and Majluf, 1984), and positively to a cash payment prompting a share price rise (Travlos, 1987).

Sometimes, the management may not have to consider the stock offer alternative if the firm has cash flows that exceed profitable investment opportunities available to the firm. This is the essence of the *free cash flow hypothesis*. It has been suggested that management may be quite willing to invest in projects whose profitability they have not considered carefully when they have excess cash flows, leading to a negative market reaction (Harford, 1999). And this they would rather do than pay the excess funds to shareholders as dividends. This may have to do with the need to pay dividends only at levels that may be sustained in the future, a policy many firms follow. But they can use such funds for stock repurchases. This may also be ignored as there is the extra incentive of spending those excess funds in a manner that increases the management's own benefits at the expense of the shareholders. In other circumstances, when the market becomes aware of payment by cash, it may react to the news positively, leading to an increase in the bidder's stock price if it ignores or is unaware of excess cash flows (not possible in a perfect market) (Lang and Litzenberger, 1989). On the other hand, it may take into account the fact that the merger was undertaken to get rid of excess cash funds, irrespective of the profitability of the investment. In this case, it will react negatively to the merger announcement (Dong *et al*., 2006).

Unlike the *free cash flow hypothesis*, the *investment opportunity hypothesis* proffers that firms foreseeing good future investment opportunities prefer to pay for their mergers in stock while other firms pay cash (Martin, 1996). The market is able to perceive the existence of those profitable future investments and therefore react positively to merger announcement with the

corresponding price rise (Jung *et al*., 1996). Another hypothesis that has been suggested to explain the basis for choosing stock over cash for payment in mergers is the *risk sharing hypothesis*. This takes account of the information asymmetry inherent in the valuation of the target by the bidder. Sometimes, after a thorough execution of due diligence, the bidder may fail to arrive at the true value of the target which, however, the target's management remains aware of. In the presence of uncertainty, those bidder managements keen to act in their shareholders' interest will choose to offer stock for payment so that any risk arising from misevaluation may be shared among the shareholders of both sides.

Another explanation given for choice between stock and cash for settling a merger deal is that in a share settlement capital gains tax is deferred to the day shares are sold. Target shareholders therefore prefer share offers to cash offers. If the bidder management insists on a cash offer, it must be prepared to pay a premium over the agreed price. Also, if target shareholders believe their shares are undervalued they will prefer stock in order to participate in the ownership of the combined firm and benefit from stock gains that will become apparent after merger. This also impels the bidder management to raise the bid price if they prefer to pay cash. Acting in the interest of their shareholders, the bidder management may offer cash due to the positive reaction it enlists from its investors, who also may react positively to a reduction in excess cash flow held in the firm.

The above discussion leads to the following hypothesis:

Hypothesis 2: Cash-paid mergers create more shareholder value than stock-paid deals.

3.4.3 Relative Size of the Target

In a merger, the size of the target relative to the bidder is important for determining how the market reacts to the transaction announcement. In this study, size is measured in total assets at the end of the financial year preceding the merger. Mergers between firms that do not differ substantially in size may create value for the bidders' shareholders if the two firms share enough similarities and this will be captured by the market. Such a firm will be easy to value due to

minimal or absence of asymmetric information. On the other hand, implementing post-merger integration between firms of similar size may pose serious challenges that may lead the market to react negatively to the merger announcement. If the size between two merging firms is rather large the market may consider that it is easy to integrate the small firm into the larger organization and react positively to the merger. Targets which are small in size relative to the bidder should therefore be more value-creating than those whose size is not so small relative to the bidder (Hawawini and Swary, 1990).

Usually, the larger a firm becomes the greater the distance grows between the management and the majority of its ordinary shareholders, who trust in the management to do what is in the former's best interest. The desire for large size may cause managements to show unusual interest in rapid expansion, especially if, in addition to other benefits of leading a large organization, size promises higher compensation for them. Such expansion may include growth through mergers and acquisitions, sometimes even unprofitable ones due to managerial *hubris*. The *managerial hubris hypothesis* points to the risk for overpayment in a merger transaction due to the bidder management's misplaced confidence in their ability for valuing the target's true worth. The market will react negatively to news involving overvaluation of the target. At the same time, once recognized as large, many a firm may attract favourable market reaction due to its reputation and the confidence market participants and the public in general may have in its ability for delivering good performance. Sometimes firms become so large that they acquire a "too big to fail" status, which virtually guarantees them government protection against insolvency for fear of its potential systemic consequences. If this is taken into account by the market, mergers involving targets of small size relative to the bidder might not be as value-creating as they would otherwise be.

The above discussion leads to the following hypothesis:

Hypothesis 3: Small targets relative to bidder create more shareholder value than large targets.

3.4.4 Serial Acquisitions

Firms that are experienced in acquiring others are expected to have mastered the skills of identifying profitable partners to merge with that they can integrate quickly into their system. DeYoung (1997) finds that bidder experience has a positive impact on CARs. And, DeLong and DeYoung (2007) report that markets are better able to evaluate mergers when they can study previous acquisition performance. The market will be aware of previous mergers which did not work quite as well as expected and will take that into account in reacting to the latest merger announcement. In addition, multiple acquirers may give the impression that they engage in mergers for reasons other than maximization of shareholder wealth alone, in which case the market might react less favorably to their merger news. The market can punish serial bidders if they form the perception that they carry out acquisitions in the interest of the management (Brown, 2000). As for bidder firms engaging in a merger for the first time or after a considerable time since their last merger, they may attract positive market reaction, based on their reputation.

The above discussion leads to the following hypothesis:

Hypothesis 4: Serial acquirers create more shareholder value than bidders with little merger experience.

3.4.5 Western and Eastern European Targets

Shareholder value creation is measured on the basis of the efficient market hypothesis, the major assumption of which is instantaneous reaction of the market to all relevant new information. Markets are expected to be efficient at least in the semi-strong form for this to happen. In practice, this is most feasible when merging firms operate in the same market. In cross-border mergers information asymmetries may cause the market to react less rapidly to merger news. Also, it may react less positively on account of inability to assess post-merger performance of the combined firm. This situation of uncertainty can be made worse where the target's financial system and market are perceived as not being developed to the level of the bidder's market. At the same time, cross-border merger studies commonly find that it is the large and efficient firms in developed markets which engage in overseas acquisitions. On this account, the market may react positively to a merger involving firms from markets at different levels of development. DeLong (2003b) finds that in market reactions to bank merger announcements made in less

developed markets than the U.S., bidders gain more wealth while targets gain less than their American counterparties. However, firms in equally well-developed markets realize wealth creation similar to that of U.S. institutions. Based on these reasons, the abnormal returns of those firms that merged with targets in Western Europe are compared with those of firms that merged with institutions from Central and Eastern Europe to see whether there is a difference in the way the market reacted to the deal announcements involving the two groups of merger.

The above discussion leads to the following hypothesis:

Hypothesis 4: Mergers with targets from Western Europe create more shareholder value than those involving CEE targets.

3.5 Empirical Results

The results of event studies performed are discussed in the following paragraphs, with reference to Appendix 3.1 at the end of the chapter where they are presented in table form.

Table 3.5 to Table 3.10 in Appendix 3.1 present the abnormal returns (ARs) and the cumulative abnormal returns (CARs) around the announcement date. The results presented are for key days within the event window, key smaller windows, and the full window of eleven days. To make the picture clearer, the results are also presented graphically in Figures 3.1 to 3.6. Results are reported for the periods five days, three days, and one day to announcement day ($CAR_{-5, 0}$; $CAR_{-3, 0}$; $CAR_{-1, 0}$), and for the day before announcement day (AR_{-1}). These results are reported to see whether it is possible to detect the likelihood of information having leaked to the market about the impending merger announcement. Often, announcement is preceded by meetings which then lead to agreement to the merger before announcement, and it is not unusual for involved parties and other stakeholders to pass the news on to people from whom subsequently the market picks the information. The results for the announcement day (AR_0) and the following day (AR_{+1}) are shown separately to highlight the importance of these two days. Assuming the announcement is made early on the event day, the market might react fully to the information on that day.

However, it is also possible that the market will not react instantaneously to the news. Knowing the results of the day after announcement is therefore important, as it also is for results pertaining to the following several days. This is why results are shown also for CARs for the periods from announcement day to the first day, the third day, and the fifth day after announcement ($CAR_{0, +1}$; $CAR_{0, +3}$; $CAR_{0, +5}$). The assumption here is that in practice different markets may react to the same information with different speeds and depending on prevailing conditions the same market may react to similar information at different speeds on different occasions and not quite as instantaneously as theory states. Finally, results are shown for the CARs for the periods one day before to one day after, three days before to three days after, and five days before to five days after announcement ($CAR_{-1, +1}$; $CAR_{-3, +3}$; $CAR_{-5, +5}$). Having reported results of the period to the announcement day and those of the period after that day within the event window, these results combine equal periods around the event day and finally the entire event window. Separate results are reported for the full sample and for the various sub-samples discussed above[15].

Figure 3.1 to Figure 3.6 depict the results graphically. Overall the graphs show that at the beginning of the event window the average standardized cumulative abnormal returns are falling and start to rise before the announcement period, reaching a peak before they decline again and then start to rise once more just at the end of the event window. There is a trend in all of the graphs of rising returns, judging from the fact that, although there is a decline after the announcement day, no graph, except one, declines to the level of the fall that occurs at the beginning of the event window. The graph presenting the abnormal returns for mergers involving Central and Eastern European targets continues to decline at the end of the event window.

3.5.1 Full Sample Merger Returns

Table 3.5 presents the results for the full sample of 56 bank mergers. The results show that market reaction to the merger announcements is largely positive when the full sample is taken into account. Of the twelve results reported, ten are positive ($CAR_{-3, 0}$; $CAR_{-1, 0}$; AR_{-1}; AR_0;

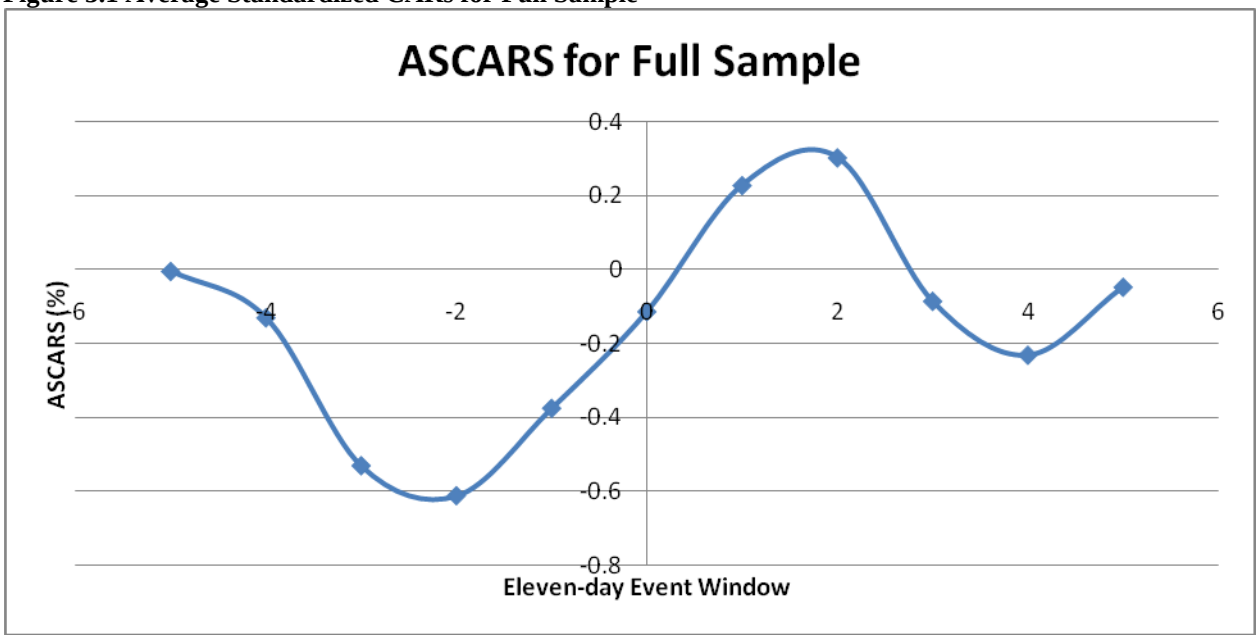
[15] In comparing the sub-sample mean returns, the non-parametric Mann-Whitney test is used assuming distribution of returns not normal.

AR_{+1}; $CAR_{0, +1}$; $CAR_{0, +3}$; $CAR_{0, +5}$; $CAR_{-1, +1}$; $CAR_{-3, +3}$) while two are negative ($CAR_{-5, 0}$; $CAR_{-5, 05}$). Of the ten positive results, eight are statistically significant. On the announcement day itself the abnormal return is positive but not statistically significant. The overall positive market reaction in the period leading to and including the announcement day may indicate that the market was anticipating the announcement. It is not unusual for information about the announcement to leak to the market and cause it to react positively in expectation of the event. There are more positive and statistically significant results after event day than before. Overall, the market's reaction is positive, which may reflect the market's confidence in the future profitability of the intended mergers. Also, the better reaction of the market post-announcement compared to pre-announcement may mean that word about the mergers might not have leaked to the market prior to announcement.

In view of the mainly positive results, the hypothesis that the abnormal and the cumulative abnormal returns are zero is rejected. This may explain why consolidation persists in banking, even in the absence of enough studies that find that it is beneficial. At the same time, there are not many studies that, like this study, report significantly positive returns for bidders. Rather, it is the target's shareholders that are reported to benefit the most from mergers. Since in this study we do not examine the targets, it is not possible to know whether the mergers investigated here resulted in substantial transfers of wealth from the bidders' shareholders to the target's shareholders, but judging from the results of this study it is rather unlikely.

The above results are consistent with Schmautzer (2006) and Houston *et al*. (2001). Both of these studies find wealth creation in bidders (in addition to targets), unlike most other studies that do not. Theory proposes wealth creation for bidders, particularly where the bidder is larger than the target, on the assumption that the bidder is also more efficient and taking over a smaller firm will not pose serious integration challenges to threaten profitability.

Figure 3.1 Average Standardized CARs for Full Sample



3.5.2 Cross-border and Domestic Merger Returns

Table 3.6 presents the results for the cross-border and domestic returns separately, and also by comparing the two. All the results for the cross-border mergers are positive. Five of them are statistically significant ($CAR_{-1, 0}$; AR_{+1}; $CAR_{0, +1}$; $CAR_{-1, +1}$; $CAR_{-3, +3}$). The cumulative results are significant for the two-day period of one day before and the event day itself, as it was the case with the full sample. On event day the result is positive, although not statistically significant.

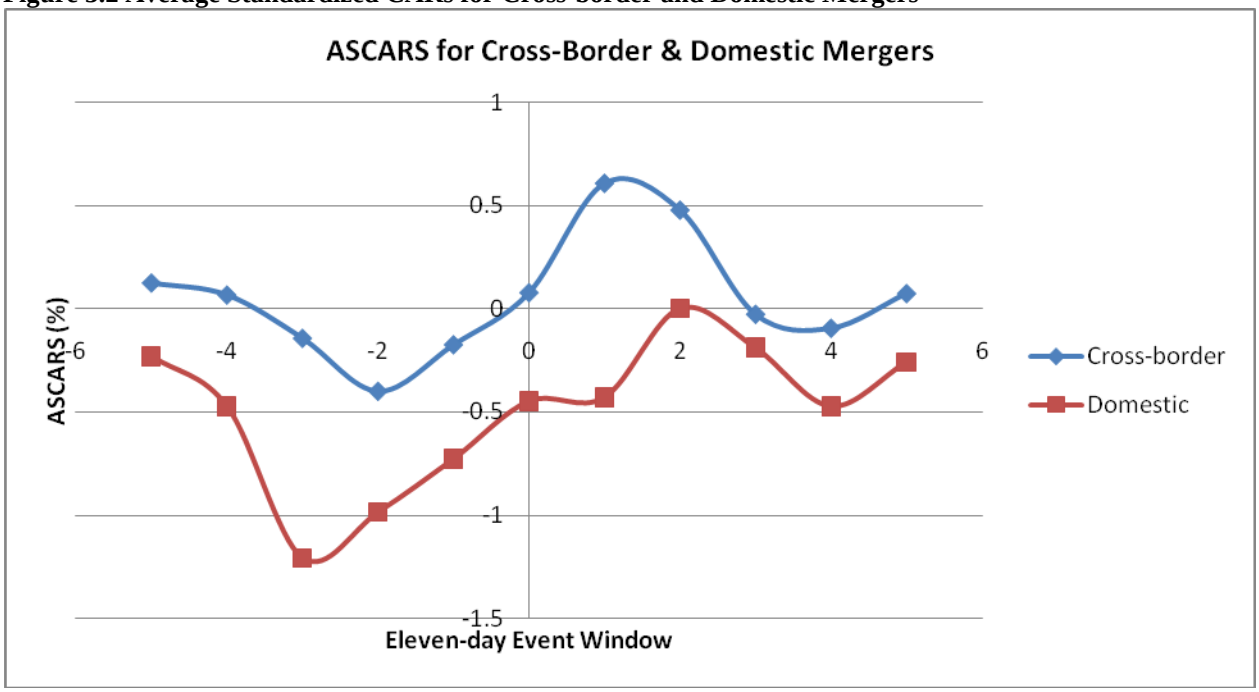
The CARs for the domestic mergers are all positive ($CAR_{-2, 0}$; $CAR_{-1, 0}$; AR_{-1}; AR_0; AR_{+1}; $CAR_{0, +3}$; $CAR_{0, +5}$; $CAR_{-3 +3}$) except for three windows ($CAR_{-5, 0}$; $CAR_{-1, +1}$; $CAR_{-5, +5}$). Four of the positive results and one of the negative results are statistically significant. The event day result is positive although not statistically significant.

From the above results it may seem that the markets favour cross-border mergers to domestic mergers. These results are consistent with the findings of some recent studies (Lepetit *et al.*, 2004; Buch and DeLong, 2004; Ekkayokkaya *et al.*, 2009). On the other hand, the results differ from those of the pioneering European study in this area (Cybo-Ottone and Murgia, 2000).

Ideally, domestic mergers may be expected to perform better than cross-border mergers since the market might be more familiar with the merging local firms. On the other hand, for the same reason the market might be better at evaluating the true worth of the merger in terms of future profitability and therefore react accordingly. A previous experience with well-performing cross-border mergers may lead to the market reacting more positively to foreign than to domestic acquisitions. On the other hand, there is no statistically significant difference between the market's reaction to the cross-border and the domestic mergers. We cannot therefore conclude that the cross-border mergers performed better than the domestic mergers.

On the basis of these results, the hypothesis that domestic mergers create more shareholder value cannot be rejected. Cross-border mergers started to pick up real momentum only in the second half of the period whose mergers are investigated in this study, after a decline in 2001-2003 as seen from Figures 1.1 and 1.2 of Chapter One. It may be said that as long as mergers slowed down in those years, markets were probably also pessimistic overall about mergers taking place then but in particular cross-border deals over which greater uncertainty is usually attached.

Figure 3.2 Average Standardized CARs for Cross-border and Domestic Mergers

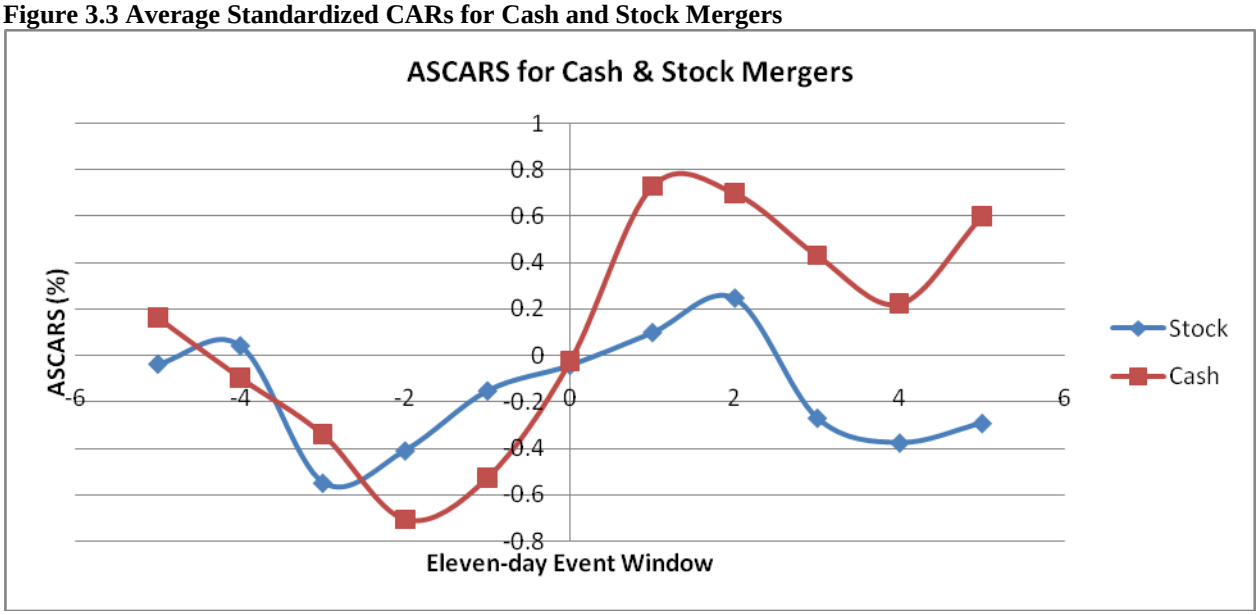


3.5.3 Cash-paid and Stock-paid Merger Returns

Table 3.7 presents the results of the cash-paid and the stock-paid sub-samples. All except one of the average cumulative standardized abnormal returns for the cash-paid mergers are positive and all except four are significant ($CAR_{-1,\ 0}$; CAR_{0}; CAR_{+1}; $CAR_{0,\ +1}$; $CAR_{0,\ +3}$; $CAR_{0,\ +5}$; $CAR_{-1,\ +1}$; $CAR_{-3,\ +3}$). This represents a quite favourable reaction of the market for the cash-settled deals. On the other hand, only five of the CARs for the stock-settled deals are positive, while seven are negative, three of them statistically significant. None of the positive results are statistically significant. From these results, it seems the market perceives cash-financed mergers as more wealth-creating than stock-financed deals, as theory currently hypothesizes. The results are consistent with the findings of other studies in the literature (Cornett *et al*., 2003; Ismail and Davidson, 2005). However, it cannot be said that there is a difference between the two sub-samples as only one result ($CAR_{0,\ +1}$) out of a possible twelve is statistically significant.

In view of the test results, the hypothesis that cash-settled mergers create more value than stock-paid mergers cannot be accepted. However, overall the results show signs of consistency with the findings of many other studies which find cash-paid mergers more value-creating.

Figure 3.3 Average Standardized CARs for Cash and Stock Mergers



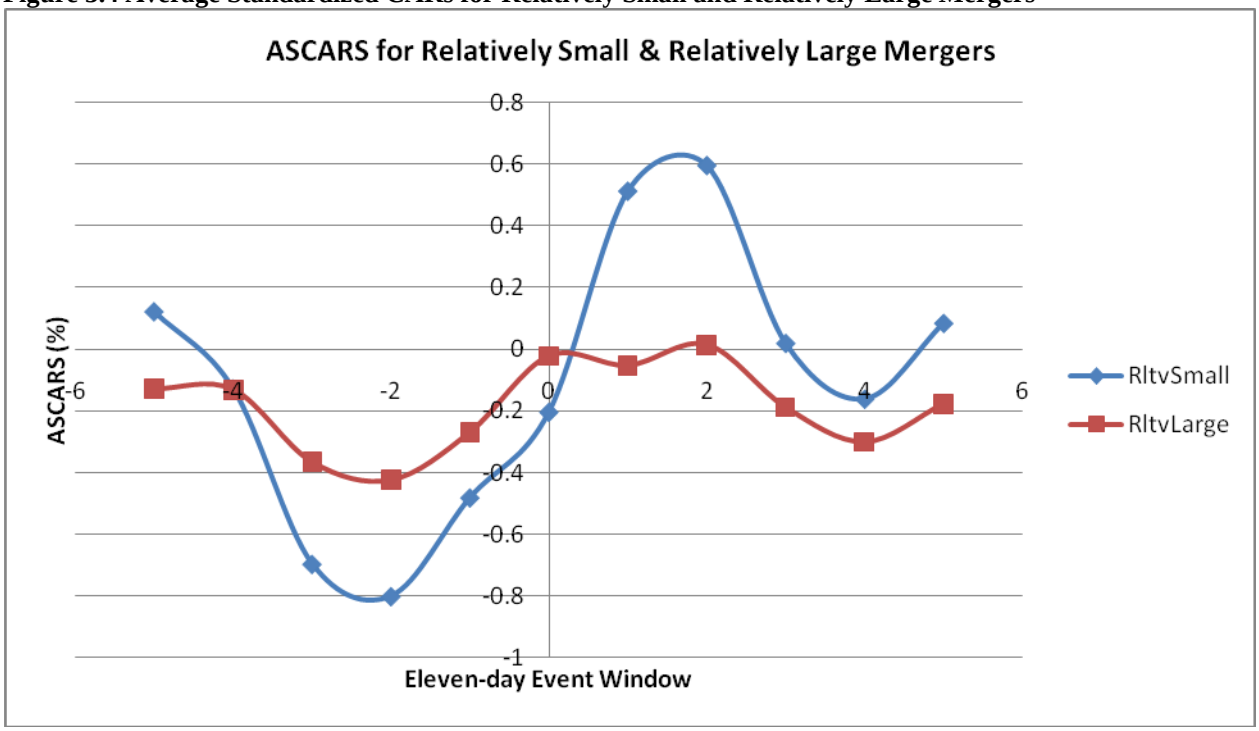
3.5.4 Relatively Large and Relatively Small Merger Returns

These sub-samples were obtained by comparing the total assets of the targets and bidders, and arranging the relative sizes from the lowest to the highest. At half-point the main sample was divided into two equal samples with twenty-eight mergers each.

Table 3.8 presents the results on the relatively small (target very small compared to bidder) and relatively large (target not so small compared to bidder) sub-samples. The market reacts quite positively to the relatively large mergers with ten of the twelve results positive, six of them statistically significant ($CAR_{-1, 0}$; CAR_{+1}; $CAR_{0, +1}$; $CAR_{0, +3}$; $CAR_{0, +5}$; $CAR_{-1, +1}$). None of the negative results is statistically significant. Ten of the results for the relatively small sub-sample are positive but only two of them are statistically significant ($CAR_{-1, 0}$; $CAR_{-1, +1}$). Neither of the negative results is statistically significant. Overall the relatively large mergers create more shareholder value than the relatively small mergers. The market seems to take into account the fact that the bidder will benefit from the advantages of large size including being "too big to fail". These results are consistent with findings of other studies in the literature (Campa and Hernando, 2006; Beitel *et al.*, 2004). However, a test of significance to compare the two sets of results shows that there is no difference between the performances of the two sub-samples.

On account of the test result, the hypothesis that relatively small targets create more shareholder value than relatively large targets is not accepted.

Figure 3.4 Average Standardized CARs for Relatively Small and Relatively Large Mergers



3.5.5 Serial and Single Merger Returns

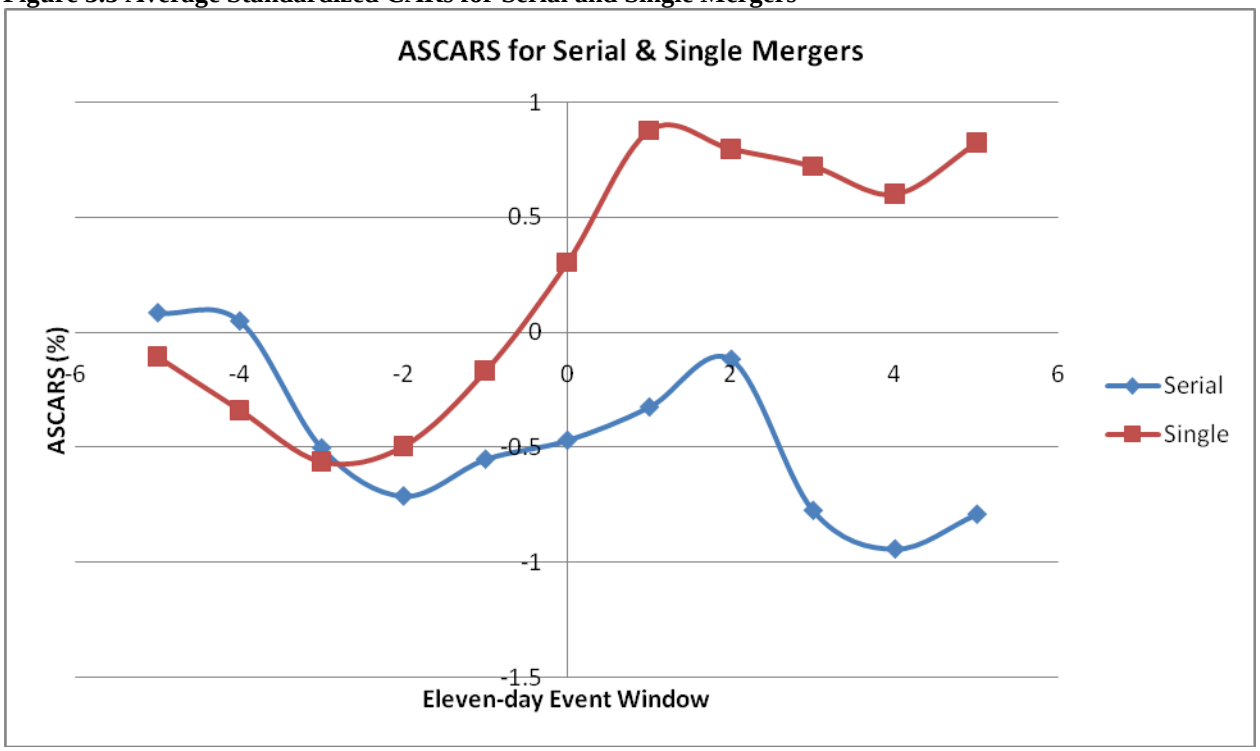
Serial mergers involve bidders that have engaged in two or more mergers during the study period. Of the 56 mergers the study investigates, 28 are classified as serial mergers while the remaining are not. Ideally, serial acquirers should not be included in a sample due to the difficulty of determining the extent to which market reaction to a new merger announcement is affected by reaction to the previous merger, which may not have dissipated. Access to only a small population of mergers made it impossible not to include serial acquirers in this study. There are other studies that have included serial acquirers in their samples due to the same reason. In their study, which resembles this one in many respects, Aggarwal *et al*. (2006) disclose that "over half of our mergers are serial mergers" (p.267).

Table 3.9 presents the results for the serial and single mergers. For the serial mergers, half are positive and the other half are negative. Of the six positive results only one is statistically significant ($CAR_{-1, +1}$), while four of the six negative results are statistically significant ($CAR_{-5, 0}$; $CAR_{-3, 0}$; $CAR_{-3 +3}$; $CAR_{-5, +5}$). In value-creation terms, these are very poor results. As for the single mergers, all the twelve results are positive, with ten of them statistically significant. Only two are not statistically significant ($CAR_{-5, 0}$; CAR_{-1}). These results demonstrate an exact opposite of the serial merger performance. These results are consistent with the findings of Beitel *et al*. (2004). To find out whether the results of the two sub-samples differ, the test turned out only two statistically significant results.

On the basis of statistical significance, the performances of the two sub-samples are not different. The hypothesis that serial mergers create more shareholder value than single mergers cannot therefore be rejected. It is obvious from the results, however, that the single mergers are by far the better performer of the two. Graphical presentation of the CARs for the entire event window demonstrates the huge performance gap between the two sub-samples (Figure 3.5).

Save for lack of statistical significance to reveal a difference between the two sub-samples, the above results are consistent with the suggestion that sometimes the market penalizes bidding firms on the assumption of acquisition in the interest of the management instead of the shareholders (Brown, 2000).

Figure 3.5 Average Standardized CARs for Serial and Single Mergers



3.5.6 Western and Central and Eastern European Merger Returns

Table 3.10 presents the results of the sub-sample of bidders that target partners in Western Europe (WEE) and those of the sub-sample of bidders merging with Central and Eastern European (CEE) targets. For the WEE mergers, all but one of the results are positive, with seven of them statistically significant ($CAR_{-1,0}$; CAR_{0}; CAR_{+1}; $CAR_{0,+1}$; $CAR_{0,+3}$; $CAR_{0,+5}$; $CAR_{-1,+1}$).

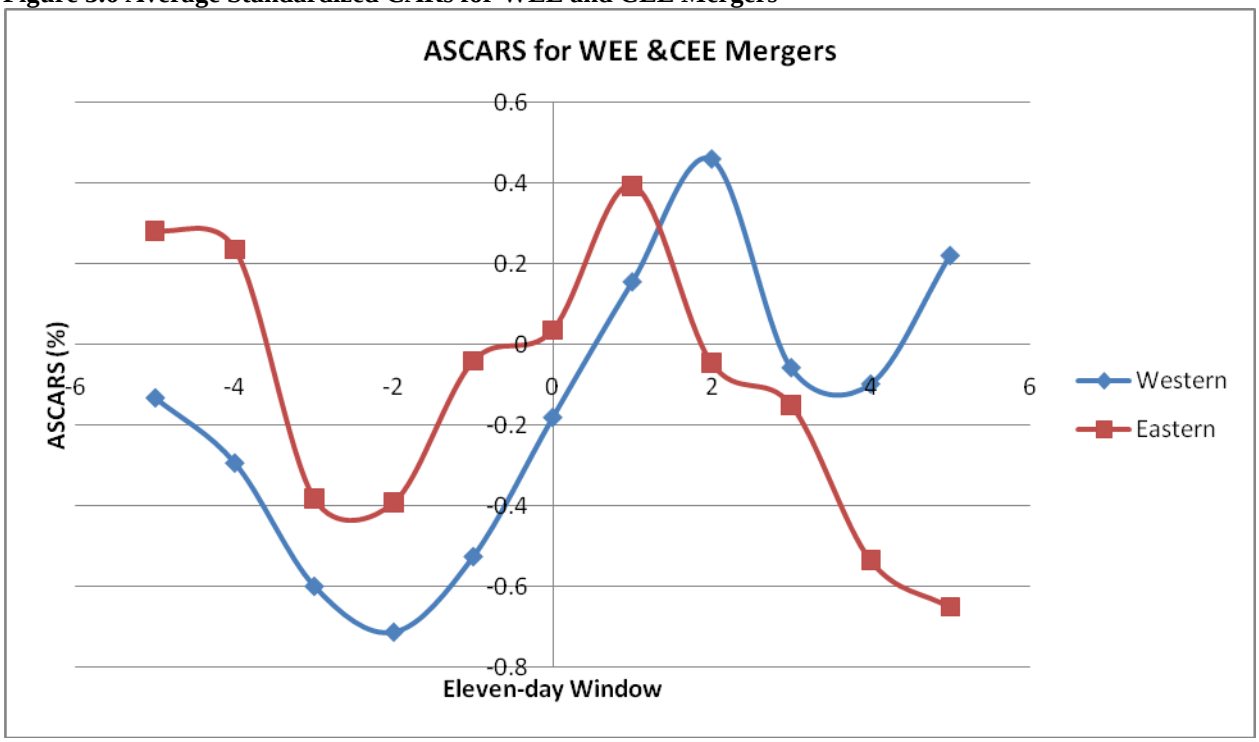
As for the CEE sub-sample, seven of the results are positive while five are negative. Of the positive results, only three are statistically significant ($CAR_{-1,+1}$; $CAR_{-1,0}$; $CAR_{0,+1}$), while two of the negative results are statistically significant ($CAR_{0,+5}$; $CAR_{-5,+5}$). It is apparent from these results that the WEE mergers display a better performance than the CEE mergers. From the graph presentation (Figure 3.6) this does not become apparent until the second day after announcement when the average standardized abnormal returns graph for CEE mergers starts to drop and continues to do so up to the last day of the event window and maybe beyond the window. It is the only one of the eleven graphs in this analysis that does not begin to rise again

from the fourth day following announcement. To find out whether the two performances are different, the test yielded no significant result.

On the basis of the test results, the hypothesis that bidders that target WEE firms for mergers create more shareholder value than those which target CEE firms cannot be accepted. Apart from the failure of the CARs graph to start to rise again on the fourth day after announcement, the graphical presentation does not differ much from the other presentations shown above. Also, the magnitude of results reported here is very similar to the magnitudes of the other sub-samples reported earlier. To this extent, a conclusion can be drawn that there is not that much difference between the financial markets of WEE and CEE countries and any existing differences might not be adequate for significantly influencing shareholder value creation either positively or negatively.

The above results differ from DeLong (2003b) who finds that wealth creation on merger announcement for bidders and targets is dependent on how developed the market is. In this case, it would be expected that WEE markets being well-developed and CEE markets less so, would react distinctly differently to merger announcements. That they did not, suggests that the gap between the two markets might have converged to a greater extent than assumed in this analysis.

Figure 3.6 Average Standardized CARs for WEE and CEE Mergers



3.5.7 Graphical Presentation in Summary

In all the above Figures, it is obvious that as expected the graphs are of similar shape since sub-samples come from the same full sample. In about half of the Figures, at the beginnimg of the event window the graph is either falling or rising, while in the other half the graph starts falling

from the first day. By the second day all the graphs are dropping, reaching a bottom before they begin to rise. By announcement day, most of the graphs have risen to positive region or are about there except for the Domestic (Figure 3.2) and the Serial (Figure 3.5) graphs which remain in negative zone for the rest of the event window. Most of the graphs start dipping again two days after announcement. Dipping lasts only two days for most of the graphs, reaching a bottom on the fourth day after announcement, and then they start rising again. As mentioned earlier, the Eastern graph (Figure 3.6) is the only one which continues to dip after the fourth day, but by the fifth day there is a sign of a positive direction change. The graphs of the Cash mergers (Figure 3.3) and the Single mergers (Figure 3.5) are unique in that after the announcement day they remain in positive territory to the end of the event window.

The fact that all the graphs start to rise towards positive territory around two days from announcement suggests that about that time the market may have started to receive information about the impending announcement. It has been noted that around two days after the announcement all the graphs start to drop. Presumably, in this four-day period the market has already impounded all the information discerned from the announcement into the firm's stock price, and now starts to look for a new level where it will settle. Most of the graphs start going up again two days later, lending support to the view that the market might be looking for a new level of prices for the stocks of the firms involved in the merger. The fact that most of the graphs do not drop to the levels of the pre-announcement period can be taken as a sign that the market's initial reaction to the proposed mergers is that overall the deals are wealth creating. It is to be noted further that whereas the event window started with the graphs falling, it ends with all of them except one rising on the last day.

In general, the graphical presentation complements the earlier individual analyses. An overall picture of wealth creation emerges from the arguments presented, save for the inadequacy of statistical significance.

3.6 Discussion and Conclusions

This chapter set out to find out whether commercial bank mergers that took place in Europe in the period 2001-2007 created value for the bidders' shareholders. In addition to checking for shareholder gains in the full sample, various sub-samples were also analyzed as presented. The majority of CARs in the full sample are positive and statistically significant, indicating evidence of value creation. As the majority of studies in bank mergers report negative or minimal merger gains for the bidder's shareholders, these results are not consistent with most pre-2000 evidence. However, they support the emerging view that post-2000 studies find wealth creation for bidders in bank mergers.

Based on the discussions on the results, there is clear evidence that the bidders' shareholders gained positive returns upon announcement of the mergers analyzed. Of the sub-samples

examined, the results of three are worth mentioning, despite not being statistically significant. First, for cash-financed mergers, the result is suggestive of a market that perceives them as being more wealth-creating than stock-financed deals. This result is consistent with a major strand of theory. Second, for serial acquirers, the result is suggestive of a market that perceives them as less wealth-creating than "single" acquirers. According to theory, serial acquirers may be wealth-creating or wealth-destroying which implies managements' pursuit of mergers in their own interest rather than that of their shareholders, as suggested in this case. Serial acquirers create value when the market recognizes that due to their experience they are more assured of achieving the merger's post-event performance expectations. Third, the result for WEE and CEE mergers, suggests that the market has a perception of post-merger performance of mergers involving WEE targets which is similar to that of mergers where a CEE firm is the target.

The main focus of the study is $CAR_{-1, 0}$ for the full sample, for which the analysis finds both positive and statistically significant results. Following an overview of the concept of bank efficiency in the next chapter, in Chapter Five the cost and profit efficiencies of the merged firms will be estimated, the results of which will be combined with the results obtained above for further analysis in Chapter Six.

3.7 Appendix 3.1: CARs around Announcement Date

Table 3.5: Bidder ARs and CARs for 56 Bank Mergers (full sample)

Days from Announcement	Means (%)	Z-statistic	P-value
$CAR_{-5, 0}$	-0.11	-0.85	0.40
$CAR_{-3, 0}$	0.02	0.12	0.90
$CAR_{-1, 0}$	0.50	3.73	0.00*
AR_{-1}	0.24	1.77	0.08**
AR_0	0.26	1.96	0.05*
AR_{+1}	0.34	2.56	0.01*
$CAR_{0, +1}$	0.60	4.52	0.00*
$CAR_{0, +3}$	0.29	2.17	0.03*
$CAR_{0, +5}$	0.33	2.46	0.01*
$CAR_{-1, +1}$	0.84	6.29	0.00*
$CAR_{-3, +3}$	0.04	0.34	0.74
$CAR_{-5, +5}$	-0.05	-0.35	0.72

*Significant at the 5% level; **Significant at the 10% level.

Table 3.6: Bidder ARs and CARs for 34 Cross-border and 22 Domestic Bank Mergers

Days from Announcement	CROSS-BORDER			DOMESTIC			Mann-Whitney Test	
	Mean (%)	Z-statistic	P-value	Mean (%)	Z-statistic	P-value	Z-statistic	P-value
$CAR_{-5, 0}$	0.07	0.41	0.69	-0.40	-1.13	0.05*	-0.50	0.62
$CAR_{-3, 0}$	0.01	0.07	0.95	0.02	3.46	0.00*	-0.16	0.87
$CAR_{-1, 0}$	0.49	2.87	0.00*	0.51	-0.01	0.99	-0.73	0.46
AR_{-1}	0.23	1.36	0.18	0.24	-0.16	0.86	-0.30	0.77
AR_0	0.26	1.51	0.13	0.27	0.27	0.78	-0.03	0.98
AR_{+1}	0.53	3.11	0.00*	0.05	-0.23	0.81	-1.13	0.26
$CAR_{0, +1}$	0.79	4.62	0.00*	0.31	-0.18	0.85	-0.90	0.37
$CAR_{0,+3}$	0.16	0.93	0.35	0.49	-4.79	0.00*	-0.68	0.50
$CAR_{0,+5}$	0.26	1.51	0.13	0.43	-2.82	0.00*	-0.58	0.56
$CAR_{-1, +1}$	1.03	5.98	0.00*	-0.28	-0.86	0.38	-1.07	0.28
$CAR_{-3, +3}$	0.34	1.96	0.05*	0.25	3.28	0.00*	-0.18	0.86
$CAR_{-5, +5}$	0.07	0.41	0.69	-0.23	0.94	0.34	-0.31	0.75

*Significant at the 5% level; **Significant at the 10% level.

Table 3.7: Bidder ARs and CARs for 26 Cash-Paid and 27 Stock-Paid Bank Mergers

Days from Announcement	CASH			STOCK			Mann-Whitney Test	
	Mean (%)	Z-statistic	P-value	Mean (%)	Z-statistic	P-value	Z-statistic	P-value
$CAR_{-5, 0}$	-0.19	-0.98	0.33	-0.14	-0.74	0.46	-0.16	0.87
$CAR_{-3, 0}$	0.12	0.62	0.53	-0.20	-1.02	0.31	0.00	1.00
$CAR_{-1, 0}$	0.66	3.34	0.00*	0.29	1.49	0.14	-1.34	0.17
AR_{-1}	0.23	1.15	0.25	0.20	1.02	0.31	-0.28	0.78
AR_0	0.43	2.19	0.03*	0.09	0.47	0.64	-1.59	0.11
AR_{+1}	0.56	2.83	0.00*	0.11	0.57	0.57	-0.82	0.41
$CAR_{0, +1}$	0.99	5.07	0.00*	0.20	1.04	0.30	-1.77	0.08**
$CAR_{0,+3}$	0.72	3.69	0.00*	-0.18	-0.83	0.41	-1.61	0.11
$CAR_{0,+5}$	0.83	4.22	0.00*	-0.40	-0.92	0.36	-0.97	0.34
$CAR_{-1, +1}$	1.22	6.22	0.00*	-0.45	2.06	0.04*	-1.15	0.25
$CAR_{-3, +3}$	0.42	2.12	0.03*	-0.41	-2.33	0.02*	-0.88	0.38
$CAR_{-5, +5}$	0.20	1.04	0.30	-0.29	-2.13	0.03*	-0.64	0.52

*Significant at the 5% level; **Significant at the 10% level.

Table 3.8 Bidder ARs and CARs for 28 Relatively Large and 28 Relatively Small Bank Mergers

Days from Announcement	RELATIVELY LARGE			RELATIVELY SMALL			Mann-Whitney Test	
	Mean (%)	Z-statistic	P-value	Mean (%)	Z-statistic	P-value	Z-statistic	P-value
$CAR_{-5, 0}$	-0.25	-1.35	0.18	0.03	0.14	0.89	-0.40	0.69
$CAR_{-3, 0}$	-0.14	-0.74	0.46	0.17	0.91	0.36	-0.31	0.76
$CAR_{-1, 0}$	0.55	2.90	0.00*	0.45	2.38	0.02*	-0.79	0.43
AR_{-1}	0.27	1.43	0.15	0.20	1.08	0.28	-0.44	0.66
AR_0	0.28	1.47	0.14	0.25	1.30	0.19	-0.11	0.91
AR_{+1}	0.68	3.58	0.00*	-0.01	0.04	0.97	-1.54	0.12
$CAR_{0, +1}$	0.96	5.05	0.00*	0.25	1.34	0.18	-1.48	0.14
$CAR_{0,+3}$	0.48	2.53	0.01*	0.10	0.54	0.59	-0.38	0.70
$CAR_{0,+5}$	0.55	2.92	0.00*	0.11	0.56	0.58	-0.28	0.78
$CAR_{-1, +1}$	1.22	6.48	0.00*	0.46	2.42	0.02*	-1.30	0.19
$CAR_{-3, +3}$	0.06	0.32	0.75	0.03	0.15	0.88	-0.13	0.89
$CAR_{-5, +5}$	-0.02	0.10	0.92	-0.11	-.60	0.55	-0.09	0.93

*Significant at the 5% level; **Significant at the 10% level.

Table 3.9 Bidder ARs and CARs for 28 Serial and 28 Single Bank Mergers

Days from Announcement	SERIAL			SINGLE			Mann-Whitney Test	
	Mean (%)	Z-statistic	P-value	Mean (%)	Z-statistic	P-value	Z-statistic	P-value
$CAR_{-5, 0}$	-0.50	-2.63	0.01*	0.27	1.43	0.15	-1.41	0.16
$CAR_{-3, 0}$	-0.56	-2.97	0.00*	0.59	3.14	0.00*	-2.26	0.02*
$CAR_{-1, 0}$	0.23	1.20	0.23	0.77	4.08	0.00*	-1.40	0.16
AR_{-1}	0.13	0.68	0.50	0.35	1.83	0.07	-0.86	0.39
AR_0	0.10	0.52	0.60	0.42	2.25	0.02*	-0.86	0.39
AR_{+1}	0.15	0.78	0.44	0.54	2.84	0.00*	-0.61	0.55
$CAR_{0, +1}$	0.25	1.30	0.19	0.96	5.09	0.00*	-0.88	0.38
$CAR_{0,+3}$	-0.20	-1.08	0.28	0.78	4.15	0.00*	-1.32	0.19
$CAR_{0,+5}$	-0.21	-1.10	0.27	0.86	4.57	0.00*	-1.01	0.31
$CAR_{-1, +1}$	0.37	1.98	0.05*	1.31	6.92	0.00*	-0.88	0.38
$CAR_{-3, +3}$	-0.86	-4.57	0.00*	0.95	5.04	0.00*	-2.20	0.03*
$CAR_{-5, +5}$	-0.80	-4.25	0.00*	0.71	3.75	0.00*	-1.62	0.11

*Significant at the 5% level.

Table 3.10 Bidder ARs and CARs for 40 WEE target and 16 CEE target Bank Mergers

Days from Announcement	WESTERN			CENTRAL & EASTERN			Mann-Whitney Test	
	Mean (%)	Z-statistic	P-value	Mean (%)	Z-statistic	P-value	Z-statistic	P-value
$CAR_{-5, 0}$	-0.17	-1.10	0.27	0.04	0.14	0.89	-0.28	0.78
$CAR_{-3, 0}$	0.10	0.65	0.51	-0.20	-0.80	0.42	-0.34	0.74
$CAR_{-1, 0}$	0.53	3.34	0.00*	0.43	1.70	0.09**	-0.48	0.63
AR_{-1}	0.19	1.21	0.23	0.35	1.40	0.16	-0.62	0.54
AR_0	0.34	2.12	0.03*	0.08	0.30	0.76	-0.85	0.39
AR_{+1}	0.34	2.13	0.03*	0.36	1.43	0.15	-0.16	0.87
$CAR_{0, +1}$	0.67	4.25	0.00*	0.43	1.73	0.08**	-0.06	0.95
$CAR_{0,+3}$	0.45	2.84	0.00*	-0.11	-0.44	0.66	-0.63	0.53
$CAR_{0,+5}$	0.70	4.45	0.00*	-0.61	-2.44	0.01*	-1.43	0.15
$CAR_{-1, +1}$	0.86	5.46	0.00*	0.78	3.13	0.00*	-0.02	0.98
$CAR_{-3, +3}$	0.22	1.37	0.17	-0.38	-1.54	0.12	-0.48	0.63
$CAR_{-5, +5}$	0.19	1.23	0.22	-0.65	-2.60	0.01*	-0.20	0.84

*Significant at the 5% level; **Significant at the 10% level.

3.8 Appendix 3.2: Tests of Significance

Table 3.11 Output from statistical tests for significance of abnormal returns $\left(Z = \sqrt{N} * ASCARS\right)$

FULLSAMPLE (N=56)

ASCARS	SQRT OF N	Z
-0.113635785	7.4833	-0.850370671
0.016549525	7.4833	0.123845057
0.498693798	7.4833	3.7318753
0.237012661	7.4833	1.773636844
0.261681137	7.4833	1.958238456
0.342157792	7.4833	2.560469408
0.60383893	7.4833	4.518707864
0.289974488	7.4833	2.169966083
0.328153237	7.4833	2.455669117
0.840851591	7.4833	6.292344708
0.044842875	7.4833	0.335572684
-0.047163686	7.4833	-0.35294001

XBORDER (N=34)

ASCARS	SQRT OF N	Z
0.069480621	5.831	0.405141503
0.011701363	5.831	0.068230646
0.491884529	5.831	2.868178687
0.232386406	5.831	1.355045133
0.259498123	5.831	1.513133554
0.533380202	5.831	3.110139956
0.792878324	5.831	4.62327351
0.16007111	5.831	0.933374642
0.259473395	5.831	1.512989364
1.02526473	5.831	5.978318642
0.336587051	5.831	1.962639095
0.069455893	5.831	0.404997313

DOMESTIC (N=22)

ASCARS	SQRT OF N	Z
-0.396633868	4.6904	1.136718289
0.024042138	4.6904	3.466311831
0.509217215	4.6904	-0.003937343
0.244162327	4.6904	-0.165313265
0.265054887	4.6904	0.275566337
0.046632251	4.6904	-0.229627306
0.311687138	4.6904	-0.187199542
0.490734253	4.6904	-4.793291258
0.434294811	4.6904	-2.821494584
-0.280560483	4.6904	-0.862974561
0.249721504	4.6904	3.288522398
-0.227393944	4.6904	0.941328697

CASH (N=26)		
ASCARS	SQRT OF N	Z
-0.192968248	5.099	-0.983945095
0.122008483	5.099	0.622121255
0.655305529	5.099	3.341402891
0.225129557	5.099	1.14793561
0.430175972	5.099	2.19346728
0.564459486	5.099	2.878178921
0.994635458	5.099	5.071646201
0.724431703	5.099	3.693877253
0.827171691	5.099	4.217748455
1.219765015	5.099	6.219581811
0.416264214	5.099	2.122531227
0.204027472	5.099	1.04033608

STOCK (N=27)		
ASCARS	SQRTN	Z
-0.141974154	5.1962	-0.737726099
-0.196893764	5.1962	-1.023099377
0.286472417	5.1962	1.488567975
0.195869752	5.1962	1.017778404
0.090602666	5.1962	0.470789572
0.109863647	5.1962	0.570873485
0.200466313	5.1962	1.041663056
-0.16038492	5.1962	-0.833392119
-0.176444295	5.1962	-0.916839845
0.396336065	5.1962	2.05944146
-0.447881349	5.1962	-2.327281068
-0.409021115	5.1962	-2.125355516

RLTVLARGE (N=28)		
ASCARS	SQRTN	Z
-0.254197849	5.2915	-1.34508792
-0.139390101	5.2915	-0.737582722
0.547611229	5.2915	2.897684818
0.269732962	5.2915	1.427291971
0.277878266	5.2915	1.470392847
0.677278871	5.2915	3.583821144
0.955157137	5.2915	5.054213991
0.478422345	5.2915	2.531571837
0.551248715	5.2915	2.916932575
1.2248901	5.2915	6.481505962
0.061153977	5.2915	0.323596269
0.019172599	5.2915	0.101451808

RLTV SMALL (N=28)		
ASCARS	SQRTN	Z
0.026926279	5.2915	0.142480406
0.172489151	5.2915	0.91272634
0.449776368	5.2915	2.379991649
0.204292359	5.2915	1.081013018
0.245484008	5.2915	1.29897863
0.007036714	5.2915	0.037234773
0.252520723	5.2915	1.336213403
0.10152663	5.2915	0.537228165
0.105057759	5.2915	0.55591313
0.456813082	5.2915	2.417226422
0.028531773	5.2915	0.150975875
-0.113499971	5.2915	-0.600585094

Table 3.11 continues next page.

SERIAL (N=28)

ASCARS	SQRT	Z
-0.497242813	5.2915	-2.631160344
-0.560934757	5.2915	-2.968186267
0.227282641	5.2915	1.202666097
0.128547716	5.2915	0.680210238
0.098734926	5.2915	0.522455859
0.147235311	5.2915	0.779095647
0.245970236	5.2915	1.301551506
-0.203620712	5.2915	-1.077458995
-0.207454952	5.2915	-1.097747879
0.374517952	5.2915	1.981761744
-0.863290394	5.2915	-4.568101122
-0.803432691	5.2915	-4.251364082

SINGLE (N=28)

ASCARS	SQRTN	Z
0.269971242	5.2915	1.428552829
0.594033806	5.2915	3.143329886
0.770104955	5.2915	4.075010369
0.345477606	5.2915	1.828094751
0.424627349	5.2915	2.246915618
0.537080274	5.2915	2.84196027
0.961707623	5.2915	5.088875889
0.783569687	5.2915	4.146258998
0.863761426	5.2915	4.570593584
1.307185229	5.2915	6.916970639
0.952976144	5.2915	5.042673265
0.709105319	5.2915	3.752230795

WEE (N=40)

ASCARS	SQRTN	Z
-0.173258342	6.3246	-1.095789709
0.103079004	6.3246	0.651933467
0.527713034	6.3246	3.337573854
0.191852504	6.3246	1.21339035
0.335860529	6.3246	2.124183504
0.336027334	6.3246	2.125238475
0.671887863	6.3246	4.249421979
0.44949899	6.3246	2.84290131
0.702986361	6.3246	4.446107542
0.863740368	6.3246	5.462812329
0.216717464	6.3246	1.370651272
0.19386749	6.3246	1.226134329

CEE (N=16)

ASCARS	SQRTN	Z
0.035420606	4	0.141682426
-0.199774173	4	-0.799096693
0.426145709	4	1.704582836
0.349913052	4	1.399652206
0.076232657	4	0.30493063
0.357483939	4	1.429935757
0.433716597	4	1.734866386
-0.108836767	4	-0.43534707
-0.608929575	4	-2.435718299
0.783629648	4	3.134518593
-0.384843598	4	-1.539374392
-0.649741626	4	-2.598966503

4

An Overview of Bank Efficiency

4.0 Introduction

This chapter presents the various concepts of efficiency and how bank efficiency is estimated in this study. An important aspect of estimating efficiency is deciding what inputs and outputs to employ, particularly because there are many variations in the literature. A good example is the difference of opinion that exists on whether deposits should be treated as input or as output. Decisions have to be made also on what methodology to use, and the variables that might affect efficiency estimates, especially when considering a sample comprising banks from more than one country, as it is the case in this study. Merger effects on bank efficiency are considered, and some discussion is presented on efficiency in cross-border mergers due to their special nature. The chapter ends with a few observations on international comparisons in efficiency.

4.1 Concepts of Bank Efficiency

4.1.1 Economies of Scale and Scope

Since in this study scale or scope economies will not be measured, only a brief discussion of these concepts is presented below.

Economies of Scale

According to Clark (1988), economies of scale are of two kinds in a multi-product firm, namely, *overall scale economies* referring to all of a firm's outputs, and *product-specific scale economies*. Overall economies of scale are realized when a firm's total costs go up less proportionately than output as a simultaneous and equal percentage increase in each of its products occurs. Product-specific economies of scale occur when the cost of producing one unit

of that product declines as its output increases. Economies of scale can be illustrated graphically as shown in Figure 4.1 below.

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Source: Sinkey (1992, p.306)

The graph shows that as output increases, the average cost of producing a product will decline where there are economies of scale, will rise where there are diseconomies of scale, and will remain constant where there are constant returns to scale.

In bank mergers, economies of scale can lead to increased profits if the increased size of the post-merger combined bank succeeds in reducing the unit cost of producing its services. Large size enables the bank to combine output quantities and input prices in proportions that can make it improve both cost and profit efficiency.

Since in practice a firm produces at various levels of output Figure 4.2 shows several levels of output and the respective short-run average cost curves given as SAC_1, SAC_2, and SAC_3. The

matching short-run marginal cost curves are given as SMC_1, SMC_2, and SMC_3. The short-run average cost curves show the minimum cost of production at the output level they represent. In the long-run the short-run average cost curves are enveloped by the long-run average cost curve (LAC) as shown. The LAC exhibits economies of scale at lower output levels as it stays above the long-run marginal cost curve (LMC) up to output level Q_m. Thereafter it exhibits diseconomies of scale and lies below the LMC.

Measurement of economies of scale is based on percentage change in output as average cost of production decreases with increased output. If total cost is represented by $TC = f(Q)$, with Q standing for output, average total cost can be designated as $ATC = f(Q)/Q$, while marginal cost will be denoted by $\partial TC/\partial Q$. Since average cost will decrease as long as it exceeds marginal cost, economies of scale can be measured as,

$$SE = \frac{ATC}{MC} = \frac{f(Q)}{Q(\partial TC/\partial Q)}$$

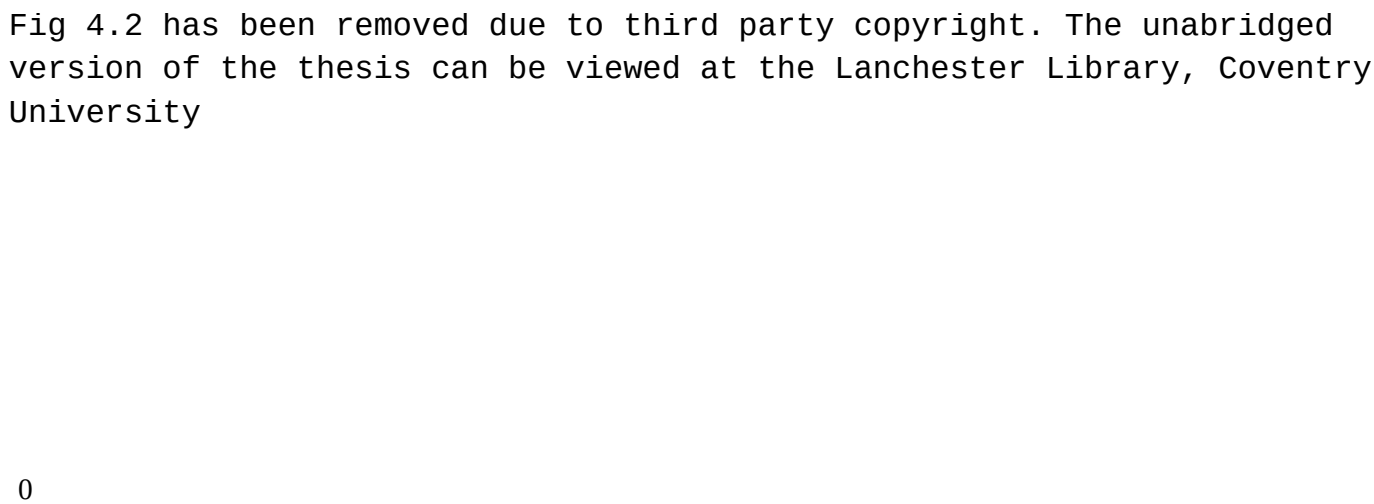
which is the elasticity of cost with respect to output. In other words, when $SE \geq 1$, $SE = 1$, and $SE \leq 1$, a firm experiences increasing, constant, or decreasing returns to scale respectively.

The above discussion is focused on the single product firm. To consider the multi-product firm, the ray average cost (RAC) concept developed by Baumol (1977) is useful. RAC extends the concept of single product economies of scale by considering the behaviour of costs as the production levels of a given output bundle change. It is defined as:

$$RAC(Q) = \frac{TC(Q)}{\sum Q_i} = \frac{TC(tq^0)}{t}$$

where q^0 stands for unit bundle of a given range of outputs which is assigned the value 1, and t

Figure 4.2 Economies of Scale with Average and Marginal Cost Curves



0

Source: Molyneux *et al*. (1996, p.138)

is the number of units in the bundle, making $tq^0 = Q$. According to Molyneux *et al*. (1996), RAC is increasing or (decreasing) at Q if $RAC(T_q)$ is an increasing (decreasing) function of scalar t, at $t = 1$. Also, RAC is minimized at Q if $RAC(Q) < RAC(T_q)$, for all positive $t = 1$. This can be seen in Figure 4.3 which depicts economies of scale for the multi-product firm. The diagram demonstrates RAC as a three-dimensional concept. OAB is a hyperplane erected on OR.

At minimum RAC, the output bundle is q^0 which occurs when production is at its most efficient scale (size) with the financial firm producing services in proportions specified by the ray OR. At q^0 the degree of scale economies is the elasticity output with respect to cost which is equal to $1/(1-e)$, where e is the elasticity of the relevant cost curve. Depending on whether returns to scale are increasing, decreasing, or constant, the degree of scale economies is greater than, less than, or equal to one. In similar manner, the RAC curve's slope will be negative, positive, or zero, respectively.

Figure 4.3 Economies of Scale for the Multi-product Firm

Fig 4.3 has been removed due to third party copyright. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University

Source: Molyneux *et al*. (1996, p.141)

Economies of Scope

Like scale economies, there are also two kinds of scope economies, namely, *global economies of scope* and *product-specific economies of scope* (Clark, 1988). Global economies of scope occur where the total cost of joint production of all of a firm's products is less than the sum of the costs of producing each product separately. Product-specific economies of scope occur where the cost of producing one product separately exceeds that of producing it jointly with the other products. *Cost complementarities* occur where upon pairing products it is found that the marginal cost of producing one of them declines when jointly produced with the other. Economies of scope are illustrated in Figure 4.4.

Figure 4.4 Economies of Scope

Source: Molyneux *et al*. (1996, p.144)

With respect to Figure 4.4, two outputs, Q_1 and Q_2 can be considered together with their cost functions, $TC(Q_1)$ and $TC(Q_2)$. With joint cost of production function expressed as $TC(Q_1, Q_2)$, economies of scope exist if $TC(Q_1, Q_2) < TC(Q_1) + TC(Q_2)$ and diseconomies exist if the inequality is reversed. In the diagram, comparison is required between $TC(Q_1^*, 0) + TC(0, Q_2^*)$, which is the sum of the heights of the cost surface over the matching points on the axes, with $TC(Q_1^*, Q_2^*)$, the height of the cost surface at point (Q_1^*, Q_2^*) which is the vector sum of $(Q_1^*, 0)$ and $(0, Q_2^*)$. When $TC(Q_1^*, Q_2^*)$ lies below the hyperplane OAB which originates at O and passes through the points $TC(Q_1^*, 0)$ and $TC(0, Q_2^*)$, the condition for economies of scope is achieved. It follows from this that the height of D, the point on plane OAB above (Q_1^*, Q_2^*), must equal $TC(Q_1^*, 0) + TC(0, Q_2^*)$ since the hyperplane is defined by $TC = aQ_1 + bQ_2$ for some constants a, b. Therefore, $TC(Q_1^*, 0) = aQ_1^*$ and $TC(0, Q_2^*) = bQ_2^*$, and $TC(Q_1^*, Q_2^*)$ must be less than $aQ_1 + bQ_2$ for economies of scope to hold (Molyneux *et al*. 1996). The basic measurement of the degree of economies of scope is given as,

$$SC = \frac{TC(Q_1) + TC(Q_2) - TC(Q_1, Q_2)}{TC(Q_{1,}, Q_2)}.$$

Economies of scope may feature less in the literature than economies of scale, but due to the multi-product nature of the banking firm, they nevertheless play an important role in the industry.

4.1.2 Sources of Scale and Scope Economies

It is possible for a management to supervise their production process in a manner that maximizes benefit for the firm. To attain efficiency in the products and services that they produce, firms strive to achieve economies of scale by increasing in size or economies of scope by jointly producing two or more products at lesser cost than that of producing the products separately. Economies of scale may also be achieved if on using technology output increases, while cost

increase less proportionately. In other words production cost per unit of output falls. If in any industry technology fosters substantial scale and scope economies, the number of firms in that industry will tend to be large (scale economies) and diversified (scope economies). These economies give the large firm room to lower prices to levels that the small firm cannot match. The reverse is true when technology fails to generate scale and scope economies leading the industry to comprise mainly of small firms. The industry will consist of both small and large firms if scale and scope economies are minimal.

Most scale economies are generated by spreading fixed costs over greater output, making better use of labour and capital. Scope economies result from two or more products using a fixed resource jointly. Computer and telecommunications technology, information, and specialized labour have been cited as major sources of scale and scope economies. Computer and telecommunications equipment, once installed, can process large amounts of transactions at minimal additional cost per unit. The more the transactions from, for example, expansion or diversification, the lower the cost per transaction will be. Overall scale economies and product-specific economies, as well as scope economies, can be achieved by embracing technology. Information usually gathered by a bank about its customers can be re-used instead of gathering it again from the same customers in need of new products, and sometimes it can be used for new customers with characteristics similar to those about whom it was originally compiled. This creates economies of scale. But economies of scope can also be achieved if the information is usable for processing a new product which shares certain features with the product for which the information is currently used.

Specialized labour is often underutilized in small firms, making it necessary to deploy it in other functions that may produce a variety of products. The cost of such labour is a fixed input which when spread over several products may generate economies of scope. As the firm grows and greater output is produced using the same labour, the cost per unit of producing more output may go down and thereby generate economies of scale.

4.1.3 Evidence of Scale and Scope Economies in Banking

Reporting on bank expansion strategies, De Paula (2002) states that the literature on economies of scale is inconclusive, as published results based mostly on 1980s data depend on the period studied and the size of the institution examined. Dymski (2000), on the other hand, points out that studies of that period found economies of scale in banks with assets as low as $100 million, but for larger banks, even where they existed, the economies generated only minimal cost advantages.

In the 1990s, various studies have reported the presence of economies of scale in banks larger than before. It has been suggested that this might be due to technological progress (Berger *et al*., 2000). Altunbas *et al*. (1997) and Goddard *et al*. *(*2001) show that by raising production and improving managerial efficiency banks can realize cost savings. Measuring economies of scope is very challenging, particularly because the underlying theory assumes single-product firms. Accordingly, doubts exist about the reliability of results declared by studies that have examined this field (Group of Ten. 2001). Casu and Molyneux (2003) report increasing evidence of efficiency advantages of large banks over small, but not due to economies of scale or scope. This is management-attributable X-efficiency, which is discussed below. There is little evidence that size strongly influences bank performance.

4.1.4 Effects of consolidation on Scale efficiency

Following a merger a bank increases in size, and this may affect its cost or revenue efficiency. Studies using 1990s data show the existence of significant cost scale economies in large financial institutions (Berger and Mester, 1997). This is in contrast to studies on 1980s data which find medium-sized institutions exhibit more cost scale efficiency than their larger and smaller counterparts. Berger and Mester (1997) suggest that technological progress might have led to improvement in efficiency by large firms.

Some institutions merge in order to diversify risk. This provides opportunity for engaging in high-risk activities but which yield high returns. Also, some clients prefer large firms for high value services which generate revenue scale economies. Studies that have investigated scale

effects on revenue or profit efficiency have reported vague results, some finding economies and others diseconomies of scale (Berger *et al*., 1996; Clark and Siems, 1997; Cummins and Weiss, 2000).

4.1.5 Effects of consolidation on Scope efficiency

Both cost scope and revenue scope efficiency effects are possible in financial institutions, particularly in a universal banking environment. However, findings by studies on cost scope efficiency effects in Europe where universal banking is prevalent do not entirely support this hypothesis. Lang and Welzel (1998) report mainly diseconomies, while Vander Vennet (1998) find little evidence of economies. Cost scope economies found in an earlier study by Allen and Rai (1996) were also quite small. At the same time, mixed results are reported by other studies that investigated product mix in addition to cost scope economies (Mester, 1993; Berger *et al*., 2000a).

Universal banking may generate revenue scope economies where, rather than seeking services in specialized institutions, customers opt for one-stop shopping, even when it means paying more. Vander Vennet (1998) finds that universal banks generate more revenues and are more profitable than specialized firms. Variations in risk associated with a universal-motivated merger may result in cost and revenue scope economies. However, some studies conducted in the US show mixed results (Kwan, 1999). Similarly, US studies which have investigated revenue and profit economies in firms providing a variety of services universal-style also report mixed results (Berger *et al*., 1996; Berger *et al*., 2000a).

In recent years, the focus of research has changed from measuring scale and scope economies to primarily estimating cost and profit efficiency. These concepts are also the focus of this research and will be discussed later.

4.1.6 X-Efficiency

In addition to economies of scale and scope, the efficiency of a production firm can be looked at from the perspective of cost minimization and profit maximization. It is the task of the management to pursue these objectives in order to maximize shareholder wealth. However, this is not always easy to achieve because of the competition firms face in the market, and internal and external factors that inhibit firms from achieving high efficiency. There are obstacles and competition for inputs in terms of quantity and quality that can produce the appropriate quantity and quality of output while pursuing the cost minimization objective. Similarly, in pursuit of the profit maximization objective, a firm faces obstacles and competition for the optimal quantity and quality to be produced that can be sold. At the same time, production depends on the level of technology in use for the required products or services. Cost minimization and profit maximization as objectives characterize productive efficiency. Depending on the inputs used, a firm will lie on or outside the production frontier of those firms that produce the maximum quantity of output, all other things being equal. And depending on the output, a firm will lie on or outside the frontier of those firms that use the minimum inputs, again all other things being equal. In other words, those firms that operate on the production frontier have the highest productive efficiency.

In the literature, the aspect of productive efficiency which is associated with input quantities is referred to as *technical efficiency*. It refers to the production of as much output as possible from a given set of inputs, or the usage of as little input as possible for producing the required output. Goddard *et al*. (2001, p.106) observe that it is analogous to the *X-efficiency* concept proposed by Leibenstein (1966). The aspect of productive efficiency associated with the proportional mix of inputs is referred to as *economic efficiency.* It occurs when the appropriate mix of inputs at existing prices is selected to produce the required output. Productive efficiency is therefore concerned with maximum production at minimum possible cost. This concept differs from that of maximizing economies of scale and scope by producing at the minimum average cost.

Sometimes, economic efficiency appears in the literature as comprising *technical efficiency* and *allocative efficiency*. The definition of technical efficiency remains the same as above, while allocative efficiency takes that part associated with optimal proportions of inputs and outputs that

promise cost minimization. Elsewhere, the literature suggests that X-efficiency is economic efficiency less scale and scope efficiencies (Berger *et al*., 1993). These authors go on to proffer that in the banking industry, accounting for only around 5% of cost inefficiencies, scale and scope inefficiencies are not as important as X-inefficiencies, which account for 20% to 25%.

Efficiency is further explained below in a context adopted from Coelli *et al*. (2005).

Input-oriented measures

This discussion is based on a firm that uses two inputs (x_1 and x_2) to produce an output q on the assumption of constant returns to scale. In Figure 4.5, SS' is the unit isoquant of fully efficient firms. According to Coelli *et al*. (2005), if a firm uses quantities of inputs defined by point P to produce a unit of output, technical inefficiency will be represented by the distance QP, the amount by which inputs could be proportionally reduced without a reduction in output. In percentage terms the technical inefficiency can be expressed as QP/0P. Technical efficiency can be expressed as:

TE=0Q/0P,

which is the same as 1-QP/0P. TE therefore takes a value between zero and one. A value of one means a firm is fully technically efficient. A firm represented by Q is fully efficient since Q lies on the fully efficient isoquant.

Technical efficiency of a firm defined using the input approach may be expressed in terms of input-distance function $d_i(x,q)$ as:

$$TE = 1/d_i(x,q)$$

Such a firm will be technically efficient if it is on the frontier, where $TE = 1$ and $d_i(x,q)$ is also equal to 1. With input price information it is possible to measure the firm's cost efficiency. Assuming w stands for the vector of input prices, let **x** represent the vector of inputs used

associated with point P. Let x' and x^* stand for the input vector associated with the technically efficient point Q and the cost-minimizing input vector at Q', respectively. Cost efficiency of the firm is defined as the ratio of input prices associated with input vectors, x and x^*, associated with points P and Q', giving:

$$CE = \frac{w'x^*}{w'x} = OR/OP$$

The slope of the isocost line, AA', represents an input price ratio which if known, then the allocative and technical efficiency can be calculated using the isocost line as follows:

$$AE = \frac{w'x^*}{w'x'} = \frac{OR}{OQ}; \qquad TE = \frac{w'x'}{w'x} = \frac{OQ}{OP}$$

Coelli *et al*. (2005) observe that these equations are based on the fact that the distance RQ represents the reduction in production costs that would occur if production were to occur at the allocatively (and technically) efficient point Q', instead of the technically efficient, but allocatively inefficient, point Q.

Overall cost efficiency can be expressed as the product of technical and allocative efficiency from:

$$TE * AE = (0Q/0P) * (0R/0Q) = (0R/0P) = CE .$$

The above estimates of efficiency are based on finding the measure by which input quantities can be reduced proportionally without changing the output produced. They assume that the production technology is known, but as that is not the case in practice efficiency has to be estimated from the sample data.

Figure 4.5 Technical and Allocative Efficiencies (Input Orientation)

Source: Coelli *et al*. (2005, p.52)

Output-oriented measures

In this discussion estimates of efficiency are based on finding the measure by which output quantities can be proportionately increased without changing the input quantities used. A firm is used which produces two outputs (q_1 and q_2) using one input (x).

Assuming constant returns to scale, the curve ZZ' in Figure 4.6 is the production possibility curve, the upper bound of production possibilities, and point A, lying below the curve, represents an inefficient firm. According to Coelli *et al*. (2005), the distance AB represents technical efficiency, being the amount by which output could be raised without additional input. Technical efficiency is therefore given by the ratio,

$$TE = 0A/0B = d_0(x,q)$$

where $d_0(x,q)$ is the output distance function at the observed input vector x and the observed output vector q.

From the diagram it is also possible to define revenue efficiency for any observed output vector p represented by the line DD'. Let q represent the observed output vector of the firm associated with point A, q' denote the technically efficient production vector associated with B, and $q*$ stand for the revenue efficient vector associated with the point B'. This allows revenue efficiency to be defined as,

$$RE = \frac{pq}{pq*} = \frac{0A}{0C}$$

With price information available, the isorevenue line, DD', can be drawn so that allocative and technical efficiency can be defined as,

$$AE = \frac{pq'}{pq*} = \frac{0B}{0C}$$

$$TE = \frac{pq}{pq'} = \frac{0A}{0B}$$

Overall revenue efficiency may be defined as the product of technical efficiency and allocative efficiency as follows:

$$RE = (0A/0C) = (0A/0B)*(0B/0C) = TE*AE$$

The above discussion (input-oriented and output-oriented measures) requires holding relative proportions of inputs (outputs) constant. This has the advantage of making the efficiency measures *units invariant*. It means that if units of measurement change, for example labour is

measured as employee hours instead of employee years the value of the efficiency measure will not be affected.

Fig 4.6 has been removed due to third party copyright. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University

Source: Coelli *et al*. (2005, p.52)

In the above presentation, allocative efficiency has been considered from a cost-minimizing standpoint and a revenue-maximizing standpoint. A profit maximizing perspective, which combines both cost minimization and revenue maximization, has not been presented on account of being more complicated and beyond what is needed for this study.

As dynamic multi-product firms, banks provide products whose inputs and outputs can change in both quantity and quality through various processes which may raise or lower efficiency, or lower one type of efficiency and raise another, and so on. With experience, new knowledge,

improved processes, acquired innovations, or use of the latest technologies, a bank may continually improve its efficiency over time.

4.2 Measurement of Bank Efficiency

Earlier studies on bank efficiency focused primarily on scale and scope economies. However, in the past two decades more interest has been directed at the role managements play in influencing efficiency of their institution by either minimizing costs or maximizing profit. It has been the practice therefore to define efficiency by reference to an imaginary best practice bank, which lies on an estimated bank industry cost frontier. The basis for this is an assumption that banks operate in perfect markets, seeking to minimize costs as they mobilize inputs for delivering a specified quantity of financial services. Sub-optimal costs or profits are attributed to X-inefficiency, a concept initiated by Leibenstein (1966). Effectively, X-inefficiency is a tool for measuring bank performance. Overall, this is the aim of any bank efficiency measurement, irrespective of which one of the several concepts of efficiency is employed. The currently prevailing concepts of bank efficiency are defined below and their estimation is considered.

4.2.1 Efficiency Estimation

Berger and Mester (1997) consider three concepts of bank efficiency. These are cost, standard profit, and alternative profit efficiency. All the three are based on economic optimization in a competitive market environment. We consider each one as follows:

Cost Efficiency

Cost efficiency measures a bank's productivity by comparing its cost with what would be a best practice bank's cost of producing the same output under similar conditions (Berger and Mester, 1997). In cost efficiency, variable costs result from prices of variable inputs, quantities of variable outputs, fixed inputs or outputs, environmental factors, random error, and efficiency. Efficiency is derived from a cost function, which can be written as,

$$C = C(w, y, z, v, uc, \varepsilon c), \qquad (1)$$

where,

C represents variable costs,

w is prices vector for variable inputs,

y is quantities vector for variable outputs,

z stands for fixed netputs (inputs or outputs) included to account for their effects on variable costs due to substitutability or complementarity with variable netputs,

v represents environmental or market variables that may influence performance,

uc is an inefficiency factor that may cause costs to rise above best practice level, and

εc stands for the random error that comprises measurement error and luck that sometimes gives banks low or high costs.

The inefficiency factor uc comprises allocative inefficiencies occasioned by suboptimal reaction to relative inputs prices w and technical inefficiencies caused by use of too much of inputs to produce y. In simplifying efficiency measurement, it is assumed the inefficiency and random error terms can be separated multiplicatively from the rest of the cost function. Allowing application of natural logs, the cost function can be rewritten as

$$\ln C = f(w, y, z, v) + \ln uc + \varepsilon c, \qquad (2)$$

where,

f is some functional form. The expression $\ln uc + \ln \varepsilon c$ is regarded as a composite error term, and various X-efficiency measurement techniques differ in their treatment of its two components, namely, the inefficiency term $\ln uc$ and the random error term $\ln \varepsilon c$.

The cost efficiency of bank b is obtained by estimating the cost needed to produce its output vector if it were as efficient as the best practice bank given similar exogenous variables (w, y, z, v), and dividing it by its actual cost, adjusted for random error. This can be represented as

$$CostEFF^b = \frac{\hat{C}^{\min}}{\hat{C}^b} = \frac{\exp[\hat{f}(w^b, y^b, z^b, v^b)] * \exp[\ln \hat{u}_c^{\min}]}{\exp[\hat{f}(w^b, y^b, z^b, v^b)] * \exp[\ln \hat{u}_c^b]}$$

$$= \frac{\hat{u}_c^{\min}}{\hat{u}_c^b}, \qquad (3)$$

where $\hat{u}_c^{\min}$ is the least of all $\hat{u}_c^b$ values for banks in the sample.

The cost efficiency ratio depicts the proportion of costs used efficiently. If Cost EFF is 0.80 the bank is 80% efficient, compared to a best practice bank (100% efficient) operating under the same conditions.

Standard Profit Efficiency

Standard profit efficiency measures how, for a given level of input prices and output prices, with other variables, a bank comes close to producing the maximum profit attainable (Berger and Mester, 1997). This means it is possible to vary inputs and outputs to improve efficiency.

In log form, the standard profit function is

$$\ln(\pi + \theta) = f(w, p, z, v) + \ln u\pi + \ln \varepsilon\pi, \qquad (4)$$

where,

π is variable profits of the bank and includes all interest and fee income generated from variable outputs less variable costs, C { of cost function},

θ is a constant added to every bank's profit to ensure the natural log taken is of a positive number

p is the vector of prices of variable outputs,

$\ln u\pi$ stands for inefficiency that reduces profits, and

$\ln \varepsilon\pi$ represents random error

According to Berger and Mester, (1997), standard profit efficiency can be defined as the ratio comparing estimated actual profits of a bank with predicted maximum profits that bank would have earned if it were as efficient as the best practice bank in the sample under consideration, net of random error. This can be expressed as

$$\text{Std } \pi EFF^b = \frac{\hat{\pi}^b}{\hat{\pi}^{\max}}$$

$$= \frac{\{\exp[\hat{f}(w^b, p^b, z^b, v^b)] * \exp[\ln \hat{u}_\pi^b]\} - \theta}{\{\exp[\hat{f}(w^b, p^b, z^b, v^b)] * \exp[\ln \hat{u}_\pi^{\max}]\} - \theta} \quad (5)$$

where, $\hat{u}_\pi^{\max}$ is the maximum value of $\hat{u}_\pi^b$ that can be found in the sample under consideration.

From the above ratio, the standard profit efficiency can be defined as the proportion of maximum profits earned, so that 0.80 would represent 80% efficiency, indicating that the bank is losing 20% of profits it could have made, through excessive costs or unearned revenue, or both. Given conditions applicable within the data observations considered, a best practice bank would achieve 100% efficiency. Whereas cost efficiency cannot be negative, profit efficiency sometimes is, which happens when a firm makes losses.

Profit efficiency takes account of errors on both the input and the output side, and it has been suggested that output side inefficiencies can be equal to or exceed those of the input side (Berger and Mester, 1993). Also, it is based on the economic goal of profit maximization which is achieved by giving equal importance in management to both revenue and costs. To this extent, profit efficiency may be considered the superior concept to cost efficiency.

While cost efficiency estimates firm performance by holding output constant at a level not necessarily related to the optimum, profit efficiency is estimated making comparison with best practice point of profit maximization within a data set. A bank can be cost efficient at one level of output and inefficient at its optimal output, as scale and mix of outputs differ with level. Standard efficiency therefore takes account of inefficiencies as it is measured at the optimal point.

Alternative Profit Efficiency

Alternative profit efficiency measures how close, given its output levels and not output prices which are allowed to vary, a bank comes to producing the attainable maximum profit. This concept can be used for estimating efficiency when some assumptions, considered below, on which cost and standard profit efficiency are based do not hold. The measure uses the same dependent variable as the standard profit function, and has common exogenous variables with the cost function (Berger and Mester, 1997). In standard profit efficiency, variations from the optimal output are regarded as inefficiency. However, in alternative profit efficiency, as in cost efficiency, variable output is held constant, while output prices may vary and influence profits. In log form, the alternative profit function may be shown as,

$$\ln(\pi + \theta) = f(w, y, z, v) + \ln u_{a\pi} + \ln \varepsilon_{a\pi}, \qquad (6)$$

which differs from the standard profit function only with y replacing p in the function, f, generating the inefficiency term $\ln u_{a\pi}$, and the random error term $\ln \varepsilon_{a\pi}$.

The ratio of alternative profit efficiency, like the standard profit efficiency ratio, compares estimated actual profits with the maximum profits predicted for a best practice bank. It is given as

$$\text{Alt } \pi \; EFF^b = \frac{a\hat{\pi}^b}{a\hat{\pi}^{\max}} = \frac{\{\exp[\hat{f}(w^b, y^b, z^b, v^b)] * \exp[\ln \hat{u}_{a\pi}^b]\} - \theta}{\{\exp[\hat{f}(w^b, y^b, z^b, v^b)] * \exp[\ln \hat{u}_{a\pi}^{\max}]\} - \theta} \qquad (7)$$

Conditions for Use of Alternative Profit Efficiency

Cost and standard profit efficiency are adequate for measuring bank efficiency given the underlying assumptions, which are violated in an environment where one or more of the following conditions apply.

1. Considerable unmeasured differences exist in the quality of services offered by banks.
2. Banks fail to attain every output scale and product mix if outputs are not fully variable.
3. Imperfect competition in output markets allows banks to exercise market power over the prices they charge.
4. Inaccuracies exist in the measurement of output prices, leading to loss of opportunities for realizing more income and profit in the standard profit function.

The above conditions are discussed briefly below.

First, alternative profit efficiency allows controlling for unmeasured output quality differences, as it takes into account the extra income that higher quality output may generate. Where output markets are competitive and bank clients are prepared to pay for better and additional services to

remain competitive, the banks that pursue those customers will earn revenues that just match their extra costs. By considering income realized in this way and allowing it to be offset against the additional costs that were incurred to earn it, the alternative profit efficiency concept accommodates high-quality banks, whereas the cost efficiency concept might penalize them due to the extra costs.

Second, one way of addressing condition 2 above is by considering bank size when measuring efficiency. There are markets where some banks can be as large as a thousand times the size of the smallest banks. Under the standard profit efficiency concept, all banks will be treated equally on the presumption that they have the same variable outputs since they operate with the same input and output prices, and, as specified in the standard profit function, face similar fixed netputs and environmental variables. But, according to Berger and Mester (1997), large banks can generate profits that are not explained by the exogenous variables. This may lead to large banks being assigned higher standard profit efficiency than smaller banks, only because the latter may fail to reach the same output levels. This problem is minimized under the alternative profit efficiency concept since outputs are held constant. Banks are compared in their ability to generate profits given the same levels of output irrespective of their size, and thereby reducing the scale bias.

Third, the alternative profit efficiency concept can also be useful in environments where banks exercise market power (condition 3 above). For example, taking output prices as given, the standard profit function presumes that a bank can sell as much output as it may wish at those prices. But banks that fail to achieve optimum output levels at the given prices may have to reduce prices in order to attain optimum output. Such banks might not be able to realize the maximum profits that the efficiency function seeks to measure, but, with the reduced prices, it may achieve optimum output. Nevertheless, this can lead to the standard profit efficiency being understated. Where market power may be exercised, it may be assumed that in the short run output levels are more or less fixed. This will provide room for efficiency differences in the setting of prices and service quality. An optimizing bank will therefore fix market-cleared prices at a level that enables it to just achieve its desired output and service quality. A bank with market

power will be able to earn revenues that exceed the cost incurred to achieve them, as there may not be competitors able or willing to offer the same level of quality. Market power also allows a bank to economize on quality by keeping costs down. Alternative profit efficiency is useful in this case because it measures how good an optimizing bank is at setting prices and service quality, and at keeping costs low for given output levels.

Finally, the alternative profit efficiency measure can be used where inaccuracies exist in the output price data (condition 4 above). One of the determinants of profit, and which therefore should explain a major part of the profit variance in the standard profit function, is the output price vector p. If, as is likely due to the nature of bank data usually available prices are inaccurately measured, the predicted portion of the standard profit function, f, in equation (4) above might explain little of the profits variance, and generate more error when estimating the efficiency term $\ln u_{\pi}$. The alternative profit function becomes useful here as, through its output quantity vector, y, it might yield a better fit.

4.2.2 Efficiency Estimation Methods

In this section we will look at the methodologies that are widely used for estimating efficiency in banking. Two bank efficiency concepts are the most widely in use, namely, cost efficiency and profit efficiency. Cost efficiency measures how close a bank's cost is to the cost of the best practice bank for producing a given output under the same conditions. Profit efficiency measures how close a bank comes to earning maximum profit for a given output, as earned by the best practice bank.

Financial Ratios

Traditionally, financial ratios have been used for estimating the efficiency of banks. They have the advantage of being easy to access and construct from the financial statements prepared periodically by banks. However, they can be difficult to interpret and even misleading as banks may construct the same ratio differently. Estimating efficiency using financial ratios does not fully consider the complexity of the banking industry (Group of Ten, 2001).

To overcome the deficiencies of the use of financial ratios, more and more studies are now using econometric methods for estimating bank efficiency.

Parametric Methods

These are econometrics methods that compare the efficiency of a bank with that of a hypothetical best practice bank determined statistically using bank inputs and outputs. Through a combination of these factors a frontier is constructed along which all efficient banks should operate. The distance of a bank from this frontier indicates how inefficient it is.

The most common parametric methods in use are Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA), and Thick Frontier Approach (TFA).

Under the SFA, a bank is inefficient if its costs exceed those predicted for an efficient bank with a similar input/output combination and the difference between them is not explained by statistical noise. According to Goddard *et al*. (2001), the SFA specifies a cost, profit, or production functional form. The cost frontier is derived by estimating a cost function whose composite error term is comprised of a one-sided error and a two-sided error. The one-sided error, denoted μ, and representing (in) efficiency is assumed to be half-normally distributed, while the two-sided error, denoted υ, and representing random error is normally distributed (Aigner et al. 1977). The combined term is given as $\mu + \upsilon = \varepsilon$. In their study, Goddard *et al*. (2001) state that both error terms are assumed to be orthogonal to inputs and outputs specified in the estimating equation or other exogenous variables. They define estimated efficiency of a firm as "the conditional mean or mode of the distribution of the inefficiency term, μ, given the observation of the composed error term, ε" (Goddard *et al*., 2001, p.121).

Goddard *et al*. (2001) refer to the inflexibility of the half-normal distribution assumed for the distribution of inefficiency, noting that the assumption presupposes most firms are nearly fully efficient. The authors give the truncated normal and the gamma distributions as examples of more suitable distributions. Berger and Humphrey (1997) point out, however, that separating

inefficiency from random error may be difficult if more flexibility is allowed in the distribution assumed for the inefficiency. And distributional assumptions not carefully chosen may give rise to considerable error in the estimation of efficiencies for individual firms (Bauer *et al*. 1998). SFA estimates are made using cross-sectional data.

The main disadvantage of the SFA is that the assumptions about the frontier form and the error terms have to be maintained, making it inflexible. This is also its advantage, in that it considers the possibility that error may arise in any measurement.

The DFA assumes that banks maintain constant inefficiency over time, and that this inefficiency can be identified by estimating a cost or profit function followed by averaging of annual residuals for individual banks over that time. It does not require specific distributional assumptions (Berger *et al*., 1993). Goddard *et al*. (2001) point out that the difference between the average residual of a firm and that of the firm on the frontier is the estimated inefficiency of that firm, allowing for truncation to be performed as random error fails to average out to zero. Also, fixed effects estimation with a dummy variable for every firm can be used in DFA, with a dummy variable's coefficient taken as its corresponding firm's inefficiency score (Lang and Welzel, 1998). As efficiency changes over time, instead of describing efficiency at a point in time, DFA highlights the average deviation of a firm from the average best-practice frontier.

The main advantage of DFA is that it avoids overemphasizing efficiency estimates of extraordinary events that can affect a bank's performance. Its disadvantage is that key aspects that influence efficiency, like the management, might change, and thereby minimize the importance of the measurement.

The TFA groups banks in the sample into four quartiles based on total cost per unit of assets. The cost frontier is the cost function estimated for the least average cost quartile (lowest quartile). Banks in this quartile are considered the most efficient, and the error term on the estimated function is taken to represent only random measurement error and luck, not differences in efficiency. Banks in the highest average cost quartile (highest quartile) are assumed to be of less

than average efficiency. As before, the error term is taken to represent measurement error and luck, not efficiency differences. It is assumed that differences in efficiency are reflected by the differences between the cost function estimated for banks in the lowest quartile and the one for banks in the highest quartile. According to Goddard *et al*. (2001), TFA does not estimate definite efficiency scores for individual firms, but gives an estimate of the general level of efficiency.

TFA has the disadvantage that the assumptions about the error term are sensitive to the number of groups that banks are divided into, and therefore do not hold exactly. Its main advantage is its simplicity.

Non-Parametric Methods

These are linear programming methods the most common of which are Data Envelopment Analysis (DEA), and Free Disposal Hull Analysis (FDHA).

The DEA is a linear programming procedure where best practice frontier observations are those for which, given inputs, there is no other decision making unit or a linear combination of them with equal or more of each output, or equal or less of each input, given outputs (Berger and Humphrey, 1997). The FDHA is a special case of DEA.

The DEA processes information on costs, outputs, and input prices for the sample under consideration, to identify the bank that achieves at least cost the output bundle produced at the given input prices. This becomes the “best practice bank” for the particular output/input prices combination. A bank’s relative efficiency is then measured as a ratio of its cost to the cost of the best practice bank with similar input prices and output combination. The main advantage of the DEA is its flexibility, in that no functional form needs to be specified for the best practice bank’s cost function. The main drawback of the DEA is that it does not provide for an error term. If, for example, there are errors in the measurement of a bank’s costs, it will be labeled more efficient than it really is. And, since there usually are factors beyond a bank’s control that may affect its performance, it will be rated less efficient than it really is. DEA is not useful for performing

statistical tests, particularly when investigating the presence of environmental variables (Ayadi and Pujals, 2005).

The FDHA is a special case of DEA, which usually estimates efficiency at higher levels than the latter (Tulkens, 1993). Typically, the DEA frontier is obtained by joining together a set of best-practice observations forming a convex curve. The data used is that of the same units being examined. In FDHA the convex frontier is abandoned for a different one where the original points could still be joined, usually with others, and may be congruent to the DEA frontier but not necessarily a curve.

"Best Frontier" Method

The main drawbacks of the frontier methods, namely, imposition of particular functional form (parametric), and not allowing random error (non-parametric), have led to intense research for a best model or set of models for measuring frontier efficiency (Goddard *et al*. 2001). As that effort continues, Bauer *et al*. (1998) have suggested a number consistency conditions that efficiency measures should satisfy for them to be useful to decision makers as outlined below:

1. Efficiency scores generated by the different approaches should have comparable means, standard deviations, and other distributional properties.
2. Different techniques should rank the institutions in approximately the same order.
3. Different methods should identify mostly the same institutions as best practice and worst practice.
4. The various approaches should demonstrate reasonable stability over time.
5. Efficiency scores generated by different techniques should be reasonably consistent with competitive conditions in the market.
6. Efficiency measured from the various approaches should be reasonably consistent with the standard non-frontier performance measures, such as return on assets or equity, or cost to income or assets ratios.

According to Bauer *et al*. (1998), of the most popular methods of estimating efficiency, DEA meets the fewest of the above conditions. And, as already stated, the TFA does not give efficiency estimates for individual firms, ruling out any comparison with other methods.

4.3 Bank Inputs and Outputs

As it is with other producers of goods and services, a bank's economic performance is measured by comparing its outputs with the inputs that produced them. This in practice is measurement of its productivity and, in its simplest form, when there is only one input producing one output, the ratio of output as numerator and input as denominator is used. With multiple inputs and outputs, measurement is more complex, particularly when comparison has to be made across different firms or over time or both and maybe with differing technologies. A bank is a multi-input and multi-output firm and fits in this later category. Measuring productivity in this case requires use of economically rational techniques to aggregate the inputs and outputs for analysis.

There is no consensus among economists on what outputs are in banking, primarily because they are not physical quantities. Treatment of deposits is also controversial, with some economists arguing that they are outputs, while the majority sees them as inputs. Various ways have been proposed for measuring output including number of accounts, assets per employee, number of transactions, aggregate value of loans, aggregate value of deposits, and value of all income including interest and non-interest income. It is clear, however, that some of these measures are more of productivity than efficiency measures. In practice, few empirical studies in banking use these measures for estimating efficiency. Bank output is given interpretation in two main approaches, the production approach and the intermediation approach, for use in empirical analysis. These are discussed below, together with a third group of approaches.

4.3.1 The Production Approach

Under this approach, banks are viewed as firms that employ labour and capital to produce loan and deposit accounts. The number of these accounts is taken as the output, and in some cases the transactions in those accounts or documents arising from them are regarded as the output. All costs used in producing and maintaining these accounts, save for interest costs which are ignored, are used in the estimation of efficiency. Only a few studies have used this approach for estimating bank efficiency, among them Berger and De Young (1997) and Ferrier and Lovell (1990).

Berger and Humphrey (1997) suggest that the production approach is best used for estimating branch efficiency in financial institutions since branches mainly process customer documents and their managements have little influence in funding and investment decisions.

4.3.2 The Intermediation Approach

This approach views the main function of banking as intermediating funds between savers and investors. Labour, capital, and deposits are taken as inputs, while loans and investments are regarded as output in estimating efficiency. In this approach, total costs include all operating costs as well as interest costs. The intermediation approach is credited to Sealey and Lindley (1977) who argue that those assets that earn income for the bank should be treated as outputs. Nevertheless, some economists treat deposits as outputs. Deposits are seen by most researchers as inputs because the bank often pays interest for holding them, and are available for channeling into income-generating investments. Others see them as output as they require safe-keeping and are the source of multiple payment services provided to depositors.

The intermediation approach is preferred by most researchers in estimating efficiency, sometimes because getting data for using in the production approach is not easy. Berger and Humphrey (1997) suggest that this approach is more appropriate for estimating efficiency for the entire bank since it takes account of all costs including interest costs which typically comprise as much as half up to two-thirds of all costs. It is also superior for use in frontier efficiency for seeking to include all costs in the objective of cost minimization for profit maximization.

4.3.3 Other Approaches

Both the production and the intermediation approaches have been criticized, as neither of them captures fully the dual role of the banking firm as an intermediary between savers and borrowers, and also as a document- and transaction-processing institution (Berger and Humphrey, 1997).

In the *value-added approach*, Berger and Humphrey (1990) suggest that any balance sheet item (asset or liability) can be classified as either input or output depending on whether it generates or destroys value. For example, Berger and Humphrey (1992) propose that loans and demand, savings, and time deposits create value for the bank, and therefore all of them should be taken as outputs. This approach has also been used by Bhattacharya *et al*. (1997).

The *user-cost approach* looks at the contribution that a final product makes to bank revenue to decide whether it is an input or an output. A product is an output if an asset generates greater returns than the opportunity cost of funds. An output also arises where a liability uses up lower costs than the opportunity cost of funds. This approach has been used by Resti (1997).

4.4 Determinants of Bank Efficiency

Bank efficiency is a function of bank-specific and external determinants. Bank-specific variables may be found in a bank's financial statements, while external variables relate to the economic and legal environment within which the bank operates. Bank-specific variables usually involve ratios, for example, the loan loss provisions to loans ratio which is often used as a proxy for risk, but may also include absolute figures like assets to represent size, although the logarithm of assets is typically used. External determinants comprise of variables like interest rates, GDP growth rate, inflation, or other macroeconomic factors, and market characteristics like ownership, market concentration or industry reforms and so on. The list is long, and every study chooses its own determinants depending on its requirements. In the following paragraphs we discuss a few of the determinants found frequently in the literature.

4.4.1 Ownership

Banks are a key player in the financial system of a country. Who owns them is a major factor in the way they operate, which affects their efficiency, and therefore that of the financial system. The efficiency of the banking industry is of interest to policy makers, shareholders, as well as foreigners keen in investing in the country. Bank ownership has been the subject of some studies.

Bonin *et al*. (2005) examine the effects of ownership, in particular foreign, on bank efficiency in 11 Central, and Eastern European transition countries. They conclude that privatization was not sufficient for increasing efficiency as government-owned and domestic private banks did not differ much in efficiency. Foreign-owned banks, especially those with a foreign strategic owner, were more cost efficient than other banks. In a previous study, Claessens *et al*. (2001) concluded that foreign banks operating in CEE countries bring competition, which leads to domestic banks cutting costs to improve efficiency. Local banks have also benefitted from technological spillovers from foreign banks. These examples demonstrate the importance of not only ownership but also variety of ownership as a determinant of bank efficiency.

4.4.2 Size

A bank is faced with the decision of what size will optimize its efficiency. Increase in size is typically found to enhance efficiency. This is why banks, like most other organizations, seek to grow, mostly internally but also by mergers and acquisitions. However, once too large, size can be disadvantageous as it leads to bureaucracy and other management downsides like deterioration or disappearance of personal touch with customers.

Size is important as a determinant of efficiency as it accounts for economies of scale. Akhavein *et al*. (1997) find a significant and positive effect of size on bank profitability. Size is also associated with capital adequacy as large banks can access less expensive capital which in turn affects profitability positively. In other studies size has been linked to capital and profitability (Goddard *et al*., 2004; Bikker and Hu, 2002). On the other hand, other studies suggest that size eventually does not give rise to cost savings and may even lead to inefficiencies (Berger *et al*., 1987).

It is expected that when banks expand, especially through consolidation, they obtain economies of scale and scope. The basic concept is that expansion allows cost reduction. Economies of scale are achieved as average cost decreases following increase in output over a given range. Economies of scope occur where the average cost is reduced as a result of joint production of more products by the expanded institution. This suggests that it is more beneficial to have a

broader rather than narrower range of products. The reduced average cost constitutes improved efficiency.

4.4.3 Environment

Banks operate in countries with different economic, legal, political, and other conditions. Within a country banks may operate in different locations and markets, face different competitors, and serve different customers.

Most efficiency studies make the assumption of a common frontier for institutions in the same banking sector, and X-inefficiency is commonly attributed to management. But efficiency may be affected by factors such as those listed above. Bos and Kool (2006) report that local market conditions explain up to 10% of the efficiency of the banks they examined. Comparing French and Spanish banks, Dietsch and Lozano-Vivas (2000) find differences in efficiency are substantially reduced when environmental variables are included in the model of estimation. Otherwise, their study finds that cost-efficiency scores for Spanish banks are lower than those of French banks. In an examination of banks across ten European countries, Carbo-Valverde *et al*. (2007) find nearly equal efficiency after controlling for differences in bank costs, bank productivity, and business environment.

4.4.4 Concentration

It has been suggested that efficient banks compete aggressively to increase their market share, leading to more concentration in the market. In fact concentration has been linked to improved profitability and therefore enhanced efficiency. However, other studies find risk aversion in concentrated markets and conclude that the relationship between concentration and efficiency is negative (Sathye, 2001). This view is supported by the “quiet life” hypothesis which suggests that high concentration leads to complacency in banking, with little incentive to take measures that improve efficiency (Berger and Humphrey, 1997).

4.4.5 Regulatory Capital

In a multi-country study of 677 banks, Pasiouras *et al*. (2009) find that capital adequacy regulations influence cost efficiency. They report that cost efficiency improves as capitalization related regulations become more stringent. And in environments where bank ownership is of considerable effect, capital adequacy requirements enhance profit efficiency.

Investigating US bank M&As, Valkanov and Kleimeier (2007) find US targets better capitalized than bidders and non-acquired peers, and higher capital levels than in European banks. They suggest that a raised capital level is a strategy to avoid regulatory scrutiny. The authors observe that, in accordance with the Basel Accord II, regulatory capital ratios are meant to indicate how risky a bank is. Excess-capital targets are therefore risk-averse. Extending the argument, they note that targets with higher regulatory capital ratios and lower equity capitalization rates are less efficient than their competitors.

Evidence that target banks are more risk-averse than their non-acquired peers is reported in O'Keefe (1996), with targets having proportionately more assets in cash balances, and proportionately less loans and securities than their peers. Also, Moore (1996) finds that the probability of acquisition is strongly and negatively related to the target's ratio of loans to total assets.

4.4.6 Risk

Banking business is by nature risky. Changes in credit risk are usually a sign of unfavorable portfolio health and this may lead to poor performance. In periods of uncertainty, sometimes brought on by fierce competition, a bank may diversify to reduce risk. Some studies find that diversification is beneficial to banks (Hughes and Mester, 1993). However, others find the opposite result. Altunbas *et al*. (2001), for example, find that bank efficiency is insensitive to credit risk.

As Europe moves steadily towards full integration of its financial markets, competition increases, making improvement of efficiency a permanent feature of the way financial institutions operate.

This situation may lead bank managers to risk-taking behaviour. Depending on ownership, bank shareholders may favour risk-taking due to the high returns that it sometimes generates. Controlling risk-taking in banking is important for the protection of depositors and the financial system. Governments usually use capital adequacy requirements for regulating the behaviour of banks on risk-taking.

Altunbas *et al*. (2007) find that inefficient European banks take minimal risk but seem to hold more capital. This is contrary to US evidence where inefficiency and bank risk-taking have a positive relationship. In Europe, Altunbas *et al*. (2007) find a negative relationship between risk and the level of capital, and suggest that this could be an indication that regulators prescribe requirements for capital meant to restrict risk-taking.

In the CEE countries, banks from Western Europe bring with them special skills in risk management and superior corporate governance leading to more efficient banks (Bonin *et al*., 2005).

4.4.7 Diversification

Diversification in banking is usually by product or geographically, and it has the implication of expansion. M&As automatically lead to larger banks. But, as seen above, size does not always guarantee benefits in banking.

Traditional banking theory recommends that, for optimality, a bank should be as diversified as possible. However, Acharya *et al*. (2006) report diseconomies for a bank that ventures into industries where there is stiff competition, or where it has no previous lending experience. Credit quality falls, and returns decline maybe due to poor monitoring, adverse selection, and increased overheads. According to the authors, the results imply that an optimal industrial organization of a banking sector is one with a few focused instead of many diversified banks.

DeLong (2001b) reports that bank mergers that aim to be focused by activity and geography perform better economically than those which seek to diversify. Consistent with this, D'Souza

and Lai (2006) observe that merging banks with different business lines but similar regional composition can form efficient organizations. But they find industrial diversification insignificantly associated with bank efficiency.

4.4.8 Strategic Similarities

Banks which are similar in certain strategic respects should find it easier to integrate activities after merger and therefore not only create merger value but do so earlier than where the target and bidder are dissimilar. The corporate finance literature suggests that profitability and market value could improve if merging institutions focus on their core business.

US studies report that mergers between banks with dissimilar geographical and product strategies may destroy shareholder value (Amihud *et al*., 2002). In Europe, a number of studies show that cross-country mergers generate considerable stock market and operating performance gains. This is particularly so in product-focused transactions (Beitel *et al*., 2004). And, Altunbas and Ibanez (2008) find that domestic mergers between banks with dissimilar earnings, loan, and deposit strategies can affect performance adversely, but dissimilarities in capitalization, technology, and innovation strategies improve performance. They report further that in cross-border mergers, divergence in loan and credit risk strategies enhance performance, while differences in capitalization, technology, and innovation strategies affect performance adversely.

4.4.9 Capital Structure

The separation of ownership and control of institutions gives rise to the agent-principal relationship that exists between managers and equity holders. This leads to the need for monitoring managers so that they act in the best interests of the institution, to maximize benefits that accrue to the equity owners. To oversee what managers do, equity holders pay a price which the corporate finance literature refers to as agency costs. Without monitoring, managers may make decisions regarding inputs and outputs in pursuit of their own preferences, not necessarily meant to maximize the organization’s value.

Most businesses have two major sources of capital, which are equity and debt. The proportion in which the two are allowed to exist in an organization, a decision greatly influenced by the managers, often determines its performance and sustenance. This capital structure has to be monitored, and the more leveraged by debt the organization is the more important it is to keep agency costs in check.

Usually the return on equity is higher than the return on debt. For the leveraged firm this means its valuation is based on an average rate of return that is less than the rate of return on equity, but greater than the rate of return on debt. For the unleveraged firm valuation will be based on the rate of return on equity. Assuming valuation is earnings divided by the rate of return, for firms with equal earnings, the leveraged firm would be valued higher than its counterpart financed by only equity. This makes debt beneficial and something to be pursued. However, the more leveraged the firm becomes the riskier it gets as probability increases of its defaulting on interest or principal payments or both.

The capital structure theory briefly explained above is relevant to banks and to bank efficiency. In fact, theoretically at least, the efficiency of a firm ought to be reflected in the valuation the market attaches to it. Banks, however, differ substantially from other firms in that their capital is regulated, ownership is restricted, and they are closely monitored by the regulators. This notwithstanding, as long as it applies to all banks, the market's valuation of a bank is relevant. And so is the need for close monitoring of the management. This is more so in the light of the existence of government deposit insurance, which may in some circumstances lead managers to engage in reckless behaviour.

We saw above that a leveraged firm will be ranked higher than the unleveraged by the market, and that in effect this can be interpreted to mean it is the more efficient firm. Lenders interpret an efficient organization (and therefore a bank) as one which can be trusted to make use of more funding (Hughes *et al*., 1999). Berger *et al*. (2006), testing the theory that leverage impacts agency costs and thereby affects performance, produce results for the US banking industry consistent with the theory.

4.4.10 Stock Market

One of the first indicators of a successful merger or acquisition is the reaction of the stock market immediately after announcement. Consolidation is expected to lead to a more X-efficient organization, resulting from better management of its resources. An efficient market will reflect such future gains through abnormal returns at the time of announcement. Scholten and De Wit (2004), looking at announcement effects of bank mergers in Europe and the US, report that overall targets experience considerable positive abnormal returns, but bidders experience much less or not at all. In the US, bidders realize negative returns, while targets earn substantial returns on announcement. In Europe, abnormal returns were found to be generally lower on announcement than in the US. However, both bidder and target benefit, with the target experiencing greater returns, but the difference with those of the bidder was small.

4.5 Merger Effects on Efficiency

Typically, firms engage in mergers aspiring to change direction or managerial conduct, and expecting improvement in X-efficiency. If the pre-merger efficiency of the bidder is greater than that of the target, X-efficiency improvement may occur by bringing the target's efficiency level to that of the bidder in the combined organization. However, higher than anticipated costs of implementation of the merger, and diseconomies of running and supervising a larger organization may lead to a decline in X-efficiency. US studies have found little or no improvement in cost X-efficiency in financial institutions, with non-bank institutions showing better results (Berger and Humphrey, 1992; Rhoades 1998; Cummins *et al*., 1999). European studies on credit institutions generally show mixed results (Vander Vennet, 1996, 1998), except for a study by Resti (1998) on Italian banks, and another by Haynes *et al.* (1999) on UK building societies, both of which report substantive post-merger cost efficiency improvement. Unlike cost-efficiency studies, US profit-efficiency studies report improved gains which they attribute to diversification of risk. This diversification allowed firms to undertake higher return activities matching the corresponding higher risk (Akhavein, *et al*., 1997; Berger, 1998; Hughes *et al*., 1999). US studies on post-merger market valuation report mixed results, with some finding market value increases (Hannan and Wolken, 1989; Cornett and Tehranian, 1992; Houston and

Ryngaert, 1994). European studies also find increases in the market value of the combined institution (Rad and van Beek, 1999).

4.6 Efficiency in Cross-border Bank Mergers

Cross-border mergers in European banking are of special interest, as exemplified by all the legislation that has been promulgated in Europe in the past thirty years aimed at removing barriers to entry, promoting competition to enhance efficiency, creating one financial services market, improving national financial systems, and maintaining financial stability across European countries. It is therefore worthwhile to discuss efficiency in cross-border mergers, albeit briefly.

4.6.1 Effects of Geographical Diversification on Efficiency

A geographically diversified institution diversifies risk by offering services whose returns may be uncorrelated or lowly correlated across different locations, resulting in improved efficiency. Also, with diversified risk the firm may engage in high risk activities which promise higher than usual returns. Research in the US has shown that large geographically diversified firms sometimes undertake high-risk but high-yielding enterprises (Hughes *et al*., 1996; Cummins and Weiss, 2000). Expected returns from high risk activities of diversified institutions in Europe might be higher than in the US given that, as reported by Berger *et al.* (2000b), bank earnings across countries are very lowly correlated compared to similar measurements across US regions.

4.6.2 Effects of Managing Long Distance on Efficiency

Many efficiency-draining challenges face an institution that has to run part of its business from a distance, including staff conflicts, reluctance of managers to be deployed where it is most beneficial to the firm, monitoring manager performance, and sustaining unfamiliar customer connections. These obstacles are concealed costs that may make it more expensive to offer similar services to those offered by local firms, or lead to less revenue or lower quality services than those offered by competitors. However, sometimes a more efficiently run firm may overcome these difficulties and perform better than local rivals. Berger and DeYoung (2000) find

that efficiency advantages and disadvantages are about equal in geographical expansion across US regions.

4.6.3 Efficiency Barriers to Consolidation in Europe

As consolidation continues in Europe, it is apparent that cross-border mergers have been less than expected. A lot has been done on the legal front to encourage integration of the financial services industry following, among other measures, the Second Banking Directive (1989), the Single Market Programme (1992), the EMU (1999), and the Euro (2002). Overall, regulatory changes eased licensing requirements, harmonized capital requirements, minimized branching and product mix controls, encouraged the spread of universal banking, and improved trade across countries.

According to Berger *et al.* (2001) the Single Market Programme was intended to create one efficient financial services market to serve the EU. With increased competition, efficiency would increase and market power would decrease, leading to a fall in prices to the level charged by the most efficient firms. Research has reported little price and market power changes (Molyneux *et al*, 1994; European Commission, 1997). Also, Berger *et al.* (2001) suggest that there might be efficiency barriers that restrict cross-border mergers and therefore slow down the establishment of a single EU market. These will include factors like language and culture differences, currency where the euro is not in use, regulatory and supervisory structures, managing from a distant headquarters, and other conditions that inhibit foreign competition directly or indirectly. These have been addressed to a great extent but not fully at the regulatory level. As long as barriers remain that make it difficult for financial institutions to achieve efficiency gains available to their competitors in European markets, cross-border mergers will lag behind domestic ones in both quantity and value. Investigating bank mergers that took place in Europe in the period 1985-1997, Berger *et al*. (2001) make the three observations discussed below.

First, cross-border mergers were smaller in value than domestic ones. Consolidation in this period took place within-country rather than across borders, suggesting that players did not see Europe as a single market. Second, despite the merits and even promotion of universal banking,

most mergers took place between institutions in the same main line of service. There was no obvious eagerness to form conglomerates that would offer a wide range of services. Third, insurance-to-insurance company mergers exceeded bank-to-bank mergers in international consolidations that occurred in that period. This led the authors to hypothesize that financial firms, depending on the main line of service, faced efficiency barriers in different degrees.

4.6.4 Evidence of Barriers to Cross-border Merger Efficiency Gains

We have seen the effects of consolidation on scale, scope, and x-efficiency. The discussion on managing an organization from a distance touched briefly on its difficulties. Operating in a foreign country, especially in Europe, may still pose challenges due to language, culture, and currency barriers. And so may unfamiliar regulatory and supervisory structures. Sometimes a country may have implicit rules that make it more difficult for a foreign institution to compete in the local market than its domestic rivals. These barriers may be high enough to hinder cross-border mergers. However, where they are low, foreign institutions that are managed with superior efficiency will be able to overcome the barriers and operate competitively in other countries. This is to say, efforts made to create a single market and one currency in Europe may reduce but not eliminate efficiency barriers to cross-border mergers. The early policies embodied by the Single Market Programme and the European Monetary Union reduced and in some cases eliminated currency and regulatory/supervisory structure differences, and even laws against competition from other EU countries. However, barriers arising from language and culture differences, implicit rules against foreign competition, and managing from a distance remained. The effects of these remaining barriers may slow down cross-border mergers in Europe.

Cross-border mergers are less likely to be found where, due to the reasons described above, domestic institutions have considerable efficiency advantages over their local competitors headquartered in other countries. This situation also makes the envisaged single EU market less likely, international competition is suppressed, there is less pressure for institutions to price services lower, and overall the financial system gains little from consolidation. The reverse is true if a substantial number of efficient foreign institutions overcome the cross-border barriers to operate efficiently in overseas markets within the EU.

Studies that have investigated the efficiency of foreign banks, both in the US and the EU, have generally found them to be less efficient than their domestic competitors. In the US, for example, foreign-owned banks are found to be considerably less cost and profit efficient than their domestic counterparts (DeYoung and Nolle, 1996; Mahajan, Rangan, and Zardkooh, 1996). In multi-country research in Europe some studies find foreign institutions less efficient than their domestic peers (Miller and Parkhe, 1998; Parkhe and Miller, 1998). Others find cost efficiency about equal in domestic and foreign banks (Vander Vennet, 1996). In a five-nation study that involved the US and four EU countries, Berger *et al.* (2000b) find that overall foreign institutions are less profit efficient than their domestic rivals. However, results differed in some cases depending on the country of origin and that of operations. For example, US-headquartered banks are found to be more efficient than domestic institutions in other countries. On the other hand, foreign banks are reported to be more efficient than their domestic rivals in Spain.

4.7 International Bank Efficiency Comparisons

In their review of international evidence on efficiency in bank mergers, Amel *et al*. (2004) point out that efficiency research in banking has mainly focused on retail banking, which caters largely for households and small firms, and not on wholesale banking which mainly serves larger organizations and other financial institutions. Although many banks serve both groups of customers, making estimation of efficiency more complicated, the assumption is usually that it is the retail aspect that is targeted without making the objective explicit. It is in retail banking where most policy issues on competition, regulation, and consumer protection relevant are most applicable. The authors also state that the banking industry may evolve differently in bank-based and market-based financial systems as far as products offered and management of risk are concerned. Countries with better financial markets have banks that offer more services, and find it easier to offload risk, making it possible to maintain better liquidity. And, in some countries commercial and investment banks are strictly separated while in others they both operate as universal banks. This gives rise to different organizations and market structures, making international comparisons more difficult.

4.8 Conclusion

This chapter reviews concepts of efficiency, starting with scale and scope economies, followed by X-efficiency, before providing the approaches currently in use for estimating cost and profit efficiency. A background is given to set the stage for the empirical work that is presented in the next chapter. Economies of scale and scope are familiar concepts which are presented clearly in the literature on bank efficiency. X-efficiency introduces the concept of desiring one or both of two objectives, namely, cost minimization and profit maximization. It is presented in parts of the literature as technical efficiency, which refers to the production of maximum output from a set of inputs, or use of minimum inputs for production of given output. Economic efficiency is shown to be concerned with the appropriate mix of inputs and therefore their prices, and is sometimes presented as comprising technical efficiency and allocative efficiency.

After presenting the concepts on which measurement of efficiency is currently widely based, namely, cost efficiency, standard profit efficiency, and alternative profit efficiency, the discussion offers descriptions of parametric and non-parametric approaches for estimation of efficiency. The Stochastic Frontier Approach (SFA), which is used in this study, is presented as the most widely used parametric method, while Data Envelopment Analysis (DEA) is submitted as the most preferred non-parametric method. The approaches for defining inputs and outputs are then discussed before looking at determinants of bank efficiency and how consolidation in banking affects efficiency. Cross-border mergers and international comparisons in bank efficiency are considered last.

In the following chapter, the efficiency of merging firms and their peers is investigated. Also examined, is whether there are improvements in the cost and profit efficiencies of the combined firm in the first few years after merger.

5

Cost and Profit Efficiency in Bank Mergers

5.0 Introduction

This chapter presents the model used for estimating efficiency and develops the hypotheses that are tested in the analysis. The empirical results are then presented. In the first part of the analysis, pre-merger cost and profit efficiencies are presented for the main sample and eight sub-samples. In the second part of the analysis, post-merger performance of the combined firm is presented for the main sample for the first, second, and third year after merger and compared to pre-merger efficiency. Similar results are presented for five sub-samples. The pre-merger efficiency of the combined firm is calculated as the sum of the bidder and target efficiencies weighted according to the total of their individual assets.

5.1 Stochastic Frontier Analysis

Bank efficiency has been estimated following the intermediation approach suggested by Sealey and Lindley (1977). The approach treats costs as inputs used to produce an output of earning assets. Stochastic frontier approach (SFA) has been used for estimating efficiency, preferring this approach to data envelopment analysis (DEA). These two are the competing methods in use for estimating efficiency but they differ in a number of ways as discussed below.

SFA assumes statistical noise while DEA does not. By not allowing statistical noise, DEA attributes all deviation from best practice to inefficiency. This suggests that all firms can produce at best-practice frontier, each institution being in control of every aspect of the production process. The advantage of SFA lies here, in the sense that it realistically assumes that there are factors which often are beyond the control of the management. Specifically, SFA assumes a two-component array of residuals: a one-sided inefficiency term that can be associated with the

management's acumen; and a normally distributed random error representing measurement error, excluded variables, and stochastic factors over which the management have no control.

Another difference between DEA and SFA is that the former, being non-parametric, needs to make only some assumptions on the basic production technology, while the latter, being parametric, has to devise solid assumptions to define the required frontier. DEA uses linear programming to define a frontier representing data on a group of homogeneous firms from a given sample. It allows this frontier to find its location underneath cost-output combinations that make it possible for a cost frontier functional form to be established relative to a best fit. This flexibility is possible because DEA does not impose any distribution form on the data. However, SFA, not being so flexible, fits a frontier based on an assumption regarding structure, and therefore, functional form is pre-specified, with inefficiency modeled as a stochastic term.

5.1.1 The Estimation Model

For estimating efficiency, the Batesse and Coelli (1995) model was used. By using that model it was possible for estimation to be done in a single stage, at the same time controlling for cross-country differences. With respect to cost efficiency, and borrowing the methodology described below from Ioannidis *et al.* (2008), the cost model used can be expressed as:

$$\ln C_{i,t} = C(y_{i,t}, w_{i,t}; \beta) + \mu c_{i,t} + \varepsilon c_{i,t}, \qquad i = 1,2,...,N; t = 1,2,...,T \qquad (1)$$

where: $C_{i,t}$ stands for Total Costs of bank i at time t; $y_{i,t}$ represents a vector of outputs; $y_{i,t}$ is a vector of input price values of a suitable functional form; β is a vector of unknown scalar parameters to be estimated; $\varepsilon c_{i,t}$ s are random errors, assumed to be i.i.d. and have $N(0, \sigma_V^2)$; $\mu c_{i,t}$ s are non-negative inefficiency effects in the model assumed to be independent but not identically distributed, so that $\mu c_{i,t}$ was obtained by truncation at zero of the $N(m_{i,t}, \sigma_u^2)$ distribution where the mean is defined as:

$$m_{i,t} = z_{i,t}\delta \qquad (2)$$

with $z_{i,t}$ representing a (1*k)vector of observable explanatory variables that influence the inefficiency of bank i at time t; and δ stands for a (k*1) vector of coefficients that were estimated. In accordance with Batesse and Coelli (1995), the parameters of equations (1) and (2) were estimated in a one-step procedure using maximum likelihood.

With the dependent variable Profit Before Tax (PBT) replacing Total Costs (C), and the inefficiency term now negative ($-\mu c_{i,t}$), the profit frontier model was specified as that of the cost frontier above. The study estimated the alternative profit efficiency due to its advantages over the standard profit efficiency. For banks in the sample that reported losses (negative profits), PBT, the dependent variable was transformed to ln ($PBT + \left|(PBT)^{\min}\right| + 1$), where $\left|(PBT)^{\min}\right|$ was the minimum absolute value of PBT reported by a bank in the sample.

Inputs and outputs were selected based on the intermediation approach suggested by Sealey and Lindley (1977), outputs being loans (y1), other earning assets (y2), and non-interest income (y3), while inputs are cost of loanable funds (w1), the cost of physical capital (w2), and the cost of labour (w3). A time trend (t=1 for 2001, t=2 for 2002, to t=7 for 2007) was included in the function to allow for technology changes over that time. Consistent with other studies the trend contains both t and t^2 terms since the translog function is a second order approximation. To control for differences in bank capitalization, equity (e) was specified as a fixed input in line with Berger and Mester (1997). To ensure linear homogeneity, the input prices and the dependent variables were normalized by the third input price w3. The resulting cost frontier model is:

$$\ln\frac{TC}{w3} = \beta_0 + \beta_1\ln(y1) + \beta_2\ln(y2) + \beta_3\ln(y3) + \beta_4\ln\left(\frac{w1}{w3}\right) + \beta_5\ln\left(\frac{w2}{w3}\right) + \beta_6\frac{1}{2}(\ln(y1))^2$$
$$+ \beta_7\ln(y1)\ln(y2) + \beta_8\ln(y1)\ln(y3) + \beta_9\frac{1}{2}(\ln(y2))^2 + \beta_{10}\ln(y2)\ln(y3) + \beta_{11}\frac{1}{2}(\ln(y3))^2$$

$$+\beta_{12}\frac{1}{2}\left(\ln\left(\frac{w1}{w3}\right)\right)^2+\beta_{13}\ln(y1)\ln\left(\frac{w1}{w3}\right)+\beta_{14}\ln(y2)\ln\left(\frac{w1}{w3}\right)+\beta_{15}\ln(y3)\ln\left(\frac{w1}{w3}\right)+$$

$$\beta_{16}\frac{1}{2}\left(\ln\left(\frac{w2}{w3}\right)\right)^2+\beta_{17}\ln(y1)\ln\left(\frac{w2}{w3}\right)+\beta_{18}\ln(y2)\ln\left(\frac{w2}{w3}\right)+\beta_{19}\ln(y3)\ln\left(\frac{w2}{w3}\right)$$

$$+\beta_{20}\ln\left(\frac{w1}{w3}\right)\ln\left(\frac{w2}{w3}\right)+\beta_{21}\ln(e)+\beta_{22}\frac{1}{2}(\ln(e))^2+\beta_{23}\ln(e)\ln(y1)+\beta_{24}\ln(e)\ln(y2)$$

$$+\beta_{25}\ln(e)\ln(y3)+\beta_{26}\ln(e)\ln\left(\frac{w1}{w3}\right)+\beta_{27}\ln(e)\ln\left(\frac{w2}{w3}\right)+\beta_{28}t+\beta_{29}t^2+\beta_{30}\ln(y1)t+\beta_{31}\ln(y2)t$$

$$+\beta_{32}\ln(y3)t+\beta_{33}\ln\left(\frac{w1}{w3}\right)t+\beta_{34}\ln\left(\frac{w2}{w3}\right)t+\beta_{35}\ln(e)t+\ln(\mu c)+\ln(\varepsilon c).$$

In order to account for bank-specific risk and country-specific economic factors, m_{it} in Equation 2 is defined as:

$$m_{it}=\delta_0+\delta_1 EQTA+\delta_2 LONDEP+\delta_3 CONCT+\delta_4 INFL+\delta_5 GDPRT+\delta_6 MACGDP+\delta_7 CLAIMS+\delta_8 CAPRQ$$

where,

$EQTA$ is abbreviation for the equity to total assets ratio, to control for differences in capital strength; $LONDEP$ is firm loans to deposits ratio, used to show how much of funding is due to borrowing and not equity; $CONCT$ is market concentration as measured by the proportion of total assets of the largest three banks to total bank assets in a country; $INFL$ is annual rate of inflation; $GDPRT$ is GDP growth rate; $MACGDP$ stands for size of a country's stock market as measured by total value of quoted shares (stock market capitalization) divided by GDP; $CLAIMS$ represents how active a country's banking sector is as measured by total banks' claims to the private sector; and $CAPRQ$ is Basel II bank capital adequacy requirements for a country. $EQTA$ and $LONDEP$ were calculated from the banks' financial statements, $INFL$ and $GDPRT$ were obtained from the International Monetary Fund World Economic Outlook (2008), and $CONCT$, $MACGDP$, $CLAIMS$ and $CAPRQ$ were obtained from an updated version of the database constructed by Beck *et al*. (2000).

Bank efficiency was estimated from the frontiers as $CE_{kt} = \exp(uc_i)$ for cost efficiency and $PEF_{kt} = \exp(-uc_i)$ for alternative profit efficiency. The value of CE_{kt} ranges from one to infinity, while that of PEF_{kt} ranges from zero to one. In order for the results to be comparable, a cost efficiency index was determined from the expression, $CEF_{kt} = 1/CE_{kt}$. This made it possible for cost efficiency, like profit efficiency, to range from zero to one, in both cases a value closer to one meaning higher efficiency.

Translog Function

As seen above, to estimate efficiency a translog approximation is employed. The most used production function in empirical research is the Cobb-Douglas cost function.[16] However, several a priori restrictions on the underlying production technology usually make it inflexible for estimating efficiency. Without those restrictions, for example, fixed returns to scale and elasticity of substitution equal to one, the translog cost function is a generalization of the Cobb-Douglas function. It is credited to Kmenta (1967) who developed it for use in approximating the CES production function, and to Christiansen *et al*. (1973) who formally introduced it. Characterized as a logarithmic second-order Taylor approximation, it uses more parameters than the Cobb-Douglas, requiring, as a result, a greater number of observations for equivalent degrees of freedom. This shortcoming of the translog form is overlooked by many researchers due to its flexibility.

5.1.2 Inputs and Outputs

The following inputs and outputs were used for this study.

Inputs

Cost of loanable funds = interest expenses/total deposits + short-term funding (w1)

Cost of physical capital = overhead expenses net of personnel expenses/book value of fixed assets (w2)

Cost of labour = personnel expenses/ total assets (w3)

[16] Cobb and Douglas (1928) address the function's introduction.

Outputs

Loans (y1)

Other earning assets (y2)

Non-interest income (y3)

Table 5.1 summarizes bidder input and output data including firm-specific and country-specific variables, while Table 5.2 shows similar data for the targets.

Table 5.1 Bidder Total Costs, Profit, Inputs, Outputs, and Firm and Country Variables

Variable	Definition	Mean	Minimum	Maximum	Stdev
TC ($)	Total Costs	6,667,066,780	75,923,000	29,955,630,000	6,176,097,830
PBT ($)	Profit Before Tax	2,655,312,270	-2,692,500,000	16,399,040,000	2,967,937,060
Inputs					
w1	Interest Expenses/Total Funds	0.033108392	0.0079900	0.1879767	0.0184657733
w2	Overheads less Personnel Expenses/Fixed Assets	3.649530385	0.0145735	73.0377793	1.02578974
w3	Personnel Expenses/Total Assets	0.008965762	0.0009380	0.0243307	0.0035394060
Outputs					
y1($)	Loans	162,365,010,000	53,759,000	919,685,000,000	155,170,430,000
y2 ($)	Other Earning Assets	181,277,520,000	630,977,000	1,192,810,000,000	197,762,880,000
y3 ($)	Non-interest Income	221,432,900	102,871,000	4,715,360,000	632,423,920
Firm-specific and Country Variables					
EQTA	Equity to Capital	0.05198351	0.0099507	0.2855840	0.0291640607
LONDEP	Loans/Deposits	0.749975493	0.0038135	2.0621441	0.2633679658
CONC	Concentration	0.66962286	0.3046170	1.000000	0.1791681237
INFL	Inflation	2.230942308	0.8200000	5.1100000	0.7409799256
GDPRT	GDP Growth Rate	2.092093407	-0.8100000	5.0500000	1.358739111
MACGDP	Market Capitalization	74.3681318	13.000000	174.00000	32.2488033
CLAIMS	Claims to Private Sector	102.464285	27.000000	186.00000	29.5770244
CAPRQ	Capital Requirements	5.608815427	3.0000000	10.000000	1.48328792

Table 5.1 and Table 5.2 show that both the bidders' total costs and profit before tax are around five times as large as those of the targets. Bidder loans are also about five times those of the target, as is non-interest income. Concentration is about the same for bidders and targets. The GDP growth rate is greater for the targets, consistent with the hypothesis that banks expanding abroad prefer to target countries with a high GDP growth rate. The bidders' Market capitalization and claims to the private sector are both about one and a half times those of the targets. The targets' inflation rate is about twice the bidders'. Finally, the targets have more stringent capital requirements than the bidders.

Table 5.2 Target Total Costs, Profit, Inputs, Outputs, and Firm and Country Variables

Variable	Definition	Mean	Minimum	Maximum	Stdev
TC ($)	Total Costs	1,437,296,090	1,675,000	23,030,423,000	3,074,435,170
PBT ($)	Profit Before Tax	487,877,664	-2,692,500,000	7,964,184,000	1,224,807,340
Inputs					
w1	Interest Expenses/Total Funds	0.035937001	0.0017727	0.2085360	0.0260292624
w2	Overheads less Personnel Expenses/Fixed Assets	3.693017530	0.0441766	326.2575758	22.0138766
w3	Personnel Expenses/Total Assets	0.013994094	0.0009380	0.0748148	0.0078909188
Outputs					
y1 ($)	Loans	31,939,636,000	2,832,000	584,200,400,000	79,645,872,000
y2 ($)	Other Earning Assets	25,208,146,000	419,000	619,883,000,000	67,531,576,000
y3 ($)	Non-interest Income	46,232,000	3,535,000	4,150,140,000	309,026,150,000
Firm-specific and Country Variables					
EQTA	Equity to Capital	0.080591278	0.0227533	0.8756527	0.0554534908
LONDEP	Loans/Deposits	0.955231085	0.0038135	16.8715900	1.19535661
CONC	Concentration	0.630254703	0.3046170	1.0000000	0.1757887354
INFL	Inflation	4.342032967	0.1100000	55.040000	7.32259398
GDPRT	GDP Growth Rate	2.835714286	-5.700000	9.3600000	2.191122693
MACGDP	Market Capitalization	48.5879120	3.000000	241.00000	30.3852303
CLAIMS	Claims to Private Sector	74.2115384	7.000000	182.00000	35.3425859
CAPRQ	Capital Requirements	6.846153846	3.000000	15.000000	2.15730204

5.2 Empirical Results

In this study, cost and alternative profit efficiency were estimated for firms involved in European commercial bank mergers that took place in the period 2001-07. The results are reported in Tables 5.3 to 5.27. Tables 5.3 to 5.12 report pre-merger results basing estimation on the financial statements of the year preceding the year of merger. And, Tables 5.13 to 5.27 report results of post-merger efficiency compared to pre-merger efficiency. Working on the assumption that targets are absorbed by the bidder after merger, the pre-merger efficiency of the combined firm is determined as the weighted sum of the pre-merger bidder efficiency and the pre-merger target efficiency, using the total assets of the bidders and targets as weights. Before the results are presented, some hypotheses relevant to the analysis performed are discussed.

It is useful to state at this stage that profit efficiency has not been widely investigated. Just about all theories are therefore based on cost efficiency. The reality that as a concept profit efficiency may be superior to cost efficiency since it takes account of both revenue and costs, was fully embraced only a decade ago or so. It is also helpful to be aware that, as most results are not

statistically significant, interpretation of the results is primarily based on the direction of influence. This necessarily impels qualified inferences.

5.2.1 Pre-merger Efficiency

In this section, the pre-merger efficiency of merging banks is estimated to see whether it is possible to discern from the results what the merger partners' intentions for going into merger were, particularly the bidders'. It is also possible to see how the efficiencies differ between various sub-samples and compare the results with theory and the results of previous studies.

Hypotheses of Interest

Some of the early studies found that bidders targeted banks that were less efficient with the intention of using their superior managerial competence and better practices to bring the efficiency level of the acquired firm to the level of the bidder post-merger (Berger and Humphrey, 1992). This is described in the literature as *the inefficient management hypothesis* and explained as less efficient banks being more likely to be acquired, while more efficient ones are more likely to acquire. In Europe, Vander Vennet (1996) finds that bidders are more cost efficient than their targets. And in a recent case, Azofra *et al*. (2008) also find that in Europe target firms tend to be less efficient than bidders. However, it is not always the case that bidders are more efficient than targets, although it is the general expectation. In a study of European bank mergers, Huizinga *et al*. (2001) find that pre-merger cost efficiency of bidder banks is less than that of the targets. Similar results are reported by Resti (1998).

The above discussion leads to the following hypothesis:

Hypothesis 1: Bidder banks target less efficient banks for merger.

It has also been suggested that large banks, which are the more likely than small banks to have the resources for instituting best practices, tend to target smaller banks in order to adopt those practices across the combined firm post-merger, as they reap the benefits of the enlarged organization. This leads to efficiency gains, according to those studies conducted using mostly US data of the 1980s. Berger and Humphrey (1997) find that, for the combined bank to gain in efficiency, the bidder should be more efficient and preferably bigger than the target. Some

studies find that in mergers large banks are more likely to be bidders than targets (Hannan and Pilloff, 2009; Pasiouras, 2011). Other studies find that large banks are more likely than small banks to be targeted for merger (Hernando *et al*., 2009). The evidence is therefore mixed, with more evidence leaning to large banks being bidders rather than targets.

The above discussion leads to the following hypothesis:
Hypothesis 2: Large banks are more efficient than smaller banks.

It has been suggested that banks that engage in mergers are more efficient than those which do not. The logic behind this is that it takes an efficient bank to approach another efficient bank for merger, or seek out a less efficient one for takeover claiming it can improve its performance. From the target's point of view it will only accept to merge or be taken over by another if there are benefits to be derived from the deal, usually demonstrated by the superior or equal performance of the bidder. An exception to this view may occur with respect to cross-border mergers, particularly where there is promise of improvements in technology and know-how. It makes sense to assume that cross-border bidders, irrespective of their own performance, will target good performers overseas since they will be easier to deal with, than to merge with a poorly performing firm in a foreign country which the bidder might not be quite familiar with.

Some studies find merged banks are more cost efficient than their peers (Peristiani, 1997), while others find the peers more efficient (Al-Sharkas *et al*., 2008), depending on the period being investigated. Huizinga *et al*. (2001) also find that merged banks are less profit efficient than their peers pre-merger, and Hagendorff and Sealey (2008) find that peers have slightly better performance before merger.

The above discussion leads to the following hypothesis:
Hypothesis 3: Banks that engage in mergers are more efficient than those that do not.

Most cross-border mergers occur by one bank from a more developed economy targeting a bank in a less developed one. In most cases the target is less efficient than the bidder. However, WEE

banks are found to target large efficient CEE banks (Lanine and Vennet, 2007). This is one of the reasons why some studies do not find evidence of significant impact of foreign ownership in the performance of CEE banks (Poghosyan and Borovicka, 2006).

The above discussion leads to the following hypothesis:
Hypothesis 4: There is little difference between the efficiencies of WEE banks and those of the CEE banks they merge with.

Banks that venture overseas may be expected to be more efficient than their domestic counterparts, and presumably have the resources to better face the challenges of international expansion. Some studies find that banks that expand abroad are generally larger and are better managed than those which do not (Focarelli and Pozollo, 2001; Berger *et al*. 2000b).

The above discussion leads to the following hypothesis:
Hypothesis 5: Cross-border bidders are more efficient than domestic bidders.

5.2.1.1 Merged and All Non-merged Banks

This analysis was performed following Kohers *et al*. (2000) who used all non-merged banks as peers instead of choosing them on the basis of size as most other studies do.

(i) Cost Efficiency

In Table 5.3 the efficiency of all merged banks is compared to that of its peers, all the banks that did not engage in mergers in the particular year. Panel A of the Table shows that over the period 2001-07 the non-merged banks were more cost efficient overall than the merged banks. In all the years examined the peers are more efficient than the merged banks, and in all of them except the first and the last year the difference in efficiency is significant. For both merged banks and peers cost efficiency seems to decline in mergers that occurred between 2002 and 2004, rising again in subsequent mergers. In this study, at an average of 70.79% the efficiency results for the merged banks are around 30% below the best practice bank, while, at an average of 75.67% the peers are around 25% less efficient than the best practice firm. The results may be interpreted to mean that the merged banks waste around 29.21% (100-70.79%) of their resources to produce the same

services offered by the best practice bank, while the non-merged banks waste about 24.33% (100-75.67%).

These results are consistent with those of Al-Sharkas *et al*. (2008) who find that peers are more cost efficient than merged banks. Theory suggests that it is the efficient banks that engage in mergers, but this may not necessarily always be the case. It has also been hypothesized that non-merging banks engage in efficiency-enhancing strategies in order to compete with their merging rivals (Evanoff and Ors, 2008).

(ii) Profit Efficiency

Panel B of Table 5.3 shows that the non-merged banks are also more profit efficient than the merged banks. The decline in efficiency for mergers occurring after 2001 is also apparent here although it is not as clear as it is for cost efficiency. Most studies tend to find merging banks are around only 50% profit efficient compared to the best practice bank (Berger and Humphrey, 1999). Merged banks in this study show similar results, but non-merged banks are above 70% efficient. The difference in efficiency between the merged banks and their peers is statistically significant throughout the years under study. The average efficiencies reported can be interpreted to mean that merged banks generate only 53.49% of the profits produced by a best practice bank while the figure for non-merged banks is 73.59%.

These results are not consistent with Hypothesis 3 which states that banks engaged in mergers are more efficient than those that are not. The results are consistent with those of Huizinga *et al*. (2001) who find that peers are more profit efficient than merged banks. The remarks on the cost efficiency results above regarding theory are also relevant for profit efficiency.

5.2.1.2 Merged and Similar-size Non-merged Banks

This analysis was performed because most studies choose peers on the basis of size.

(i) Cost Efficiency

Efficiency was estimated for peers selected on the basis of similarity of total asset size of bidders and targets, so as to have peers equal in number to the firms in the sample. The results are reported in Table 5.4. As before, the peers are generally more cost-efficient than the merged banks. In 2001 and 2007, merged banks have higher efficiencies than the peers but the differences are not statistically significant. Also, in year 2004 the amount by which peer efficiency exceeds merged bank efficiency is not statistically significant. The other results are all statistically significant. At 76.06%, peer efficiency is only marginally higher than that of the peers analyzed above of 75.67%, suggesting that the manner in which peers are selected might not critically affect the results obtained from the analysis. Here the results may be interpreted to mean that the merged banks waste about 29.21% (as before) of their resources to produce the same services as the best practice bank, while the non-merged banks waste about 23.94%.

Similar observations to those made on the cost efficiency results in Section 5.2.1.1 above apply to these results.

(ii) Profit Efficiency

Panel B shows that, as before, the peers are more profit efficient than the merged banks. The differences in efficiency between the merged banks and their peers are statistically significant for all the years under investigation. At 71.56% peer profit efficiency is slightly smaller than that of the peers analyzed above of 73.59%, again suggesting that the manner in which peers are selected might not critically affect the results obtained from the analysis. Overall, there does not seem to be much difference between the results of the two sets of peer banks in both cost and profit efficiency. The results may be interpreted to mean that the merged banks generate 53.49% of the profits generated by the best practice bank while the non-merged banks generate 71.56%.

These results are also not consistent with Hypothesis 3 which states that banks engaged in mergers are more efficient than those that are not. Similar observations to those made on the profit efficiency results in Section 5.2.1.1 above apply here.

5.2.1.3 Bidder Banks and Target Banks

(i) Cost Efficiency

The efficiencies of bidder and target banks are reported in Table 5.5, where from Panel A the targets are shown to be more cost efficient than the bidders on average, although the yearly differences in efficiency are not statistically significant. Like before, there is a decline in efficiency for several years after 2001 for both the bidders and the targets before it rises again towards the end of the period. For four of the seven years analyzed, targets are more cost efficient than bidders, while for three of those years it is the bidders which are more efficient. At 70.19% the average cost efficiency for bidders may be interpreted to mean that those banks waste 29.81% of their resources to produce the same services offered by the best practice bank, while at 71.39% efficiency wasted resources for the targets amount to 28.61%.

These results differ from theory, which suggests that bidders are more efficient than targets. If they were statistically significant, they would be consistent with those reported by studies that find bidding banks are less cost efficient than targets (Resti, 1998; Huizinga *et al*., 2001).

(ii) Profit Efficiency

Panel B of Table 5.5 shows that on the average bidders are more profit efficient than targets during the period 2001-07. In most of the seven years that the study covers, bidders are more profit efficient than targets. The differences in efficiency, however, are not statistically significant. The results are consistent with the suggestion in the literature that sometimes firms take over others in order to improve their performance through a superior management. The profit efficiency for the bidders may be interpreted to mean that those bidders generate only 55.27% of the profits made by the best practice bank operating under similar conditions, while targets generate only 51.71%. In this case as well there is a decline in efficiency for both bidders and targets for mergers that took place in the several years after 2001 followed by a rise which, however, does not reach the levels of 2001.

These results imply support for Hypothesis 1 which suggests according to theory that efficient banks target less efficient ones. If they were statistically significant, they would be consistent

with those reported by studies that find that bidders are more profit efficient than targets (Beitel *et al*., 2004).

5.2.1.4 Cross-border Bidders and Domestic Bidders

(i) Cost Efficiency

Panel A of Table 5.6 shows that cross-border bidders are on average more cost efficient than domestic bidders. In four of the seven years analyzed cross-border bidder cost efficiency exceeds domestic bidder cost efficiency. In the other three years, domestic bidder efficiency is higher. However, none of the differences in efficiency are statistically significant.

These results suggest conformity with the theory that it takes a well-managed and therefore efficient bank to venture abroad. And if they were statistically significant they would be consistent with similar findings from studies that have investigated cross-border and domestic mergers (Focarelli and Pozollo, 2001).

(ii) Profit Efficiency

Panel B of Table 5.6 reports profit efficiency showing that cross-border bidders are on average more profit efficient than domestic bidders. None of the yearly differences in efficiency between the cross-border and the domestic bidders are statistically significant.

These results show weak support for the theory that it takes a well-managed and therefore efficient bank to venture abroad. If they were statistically significant they would be consistent with findings of similar studies that have investigated cross-border and domestic mergers (Focarelli and Pozollo, 2001).

5.2.1.5 Cross-border Bidders and Targets

(i) Cost Efficiency

In Panel A of Table 5.7 cross-border targets are shown to be more cost efficient than the bidders on average. Both bidder and target efficiencies appear to decline for mergers that took place in the several years after 2001 before they rise again in the mergers that occurred towards the end

of the investigation period. Differences in efficiency between bidders and targets are not statistically significant in any of the years investigated.

There is no theory specific to cross-border bidder and target efficiencies. In its absence, the normal theory that bidders generally target less efficient banks applies. To that extent, these results are not consistent with theory. If they were statistically significant, they would be consistent with studies that report findings that are contrary to theory (Huizinga *et al*., 2001).

(*ii) Profit Efficiency*

Profit efficiency is reported to be greater for cross-border bidders than for targets as shown in Panel B of Table 5.7. The difference in efficiency between the two groups is not statistically different in any of the years investigated. With targets more cost efficient than bidders while the latter are more profit efficient than the former, it seems bidders are interested in firms that can control costs very well, which benefits consumers but not shareholders, and may be aiming to improve their profitability for the advantage of the owners.

In the absence of theory on cross-border bidder and target efficiencies as reported above, these results are considered under the theory that bidders target less efficient partners. The results reported are suggestive of conformity with theory. If they were statistically significant, they would be consistent with similar studies that support the theory (Beitel *et al*. 2004).

5.2.1.6 Domestic Bidders and Domestic Targets

(i) Cost Efficiency

Table 5.8 reports the results of domestic bidders and targets. In Panel A domestic targets are shown to be more cost efficient than the bidders. Differences in efficiency between bidders and targets are statistically significant only for mergers that occurred in 2005. In all the years except 2002 target efficiency exceeds bidder efficiency. As observed in some of the other results reported above, efficiency seems to decline for several years for the mergers that took place after 2001 before it rises again towards the end of the period under investigation.

Save for lack of statistical significance, the results are in conformity with theory and consistent with similar studies that find bidders are more cost efficient than targets (Vander Vennet, 1996).

(ii) Profit Efficiency

Results reported in Panel B of Table 5.8 show that domestic bidders are more profit efficient than targets on average. Difference in efficiency between the bidders and the targets is only significant for the 2007 results. With bidders more profit efficient than targets and the latter more cost efficient than the former, it seems bidders aspire to merge with firms that can control costs very well, to the benefit of consumers, and then through better management improve profitability for the advantage of shareholders.

These results are similar to those reported on cost efficiency with regard to theory and if they were statistically significant they would be consistent with similar studies that find bidders are more profit efficient than targets (Beitel *et al*. 2004).

5.2.1.7 Large and Small Mergers

To analyze efficiency further, the sample was partitioned into large and small mergers. Some studies have done this by finding the median value of total assets of bidders and targets and then taking those where both the bidder and the target had above median values as large and the rest as small mergers (Al Sharkas *et al*., 2008). An attempt to do that in this study produced a rather biased proportion of only nine large mergers against forty-seven small mergers. Therefore, these sub-samples were obtained by comparing the total assets of the targets and bidders, and arranging the relative sizes from the lowest to the highest. At half-point the main sample was divided into two equal samples with twenty-eight mergers each. This resulted in 28 mergers in each subsample, and the relevant results are reported in Table 5.9.

(i) Cost Efficiency

Cost efficiency is reported in Panel A where large banks are shown to be marginally more cost efficient than small banks on average. During the period, cost efficiency for the large banks averaged 71.24% against 70.35% for the small banks. This can be interpreted to mean that large

banks waste 28.76% of their resources to produce the same services as the best practice bank, while small banks waste 29.65%. Large banks are more cost efficient in four of the years analyzed while small banks are more efficient in three of those years. The difference in efficiency between the large and the small banks is not significant in any of the years.

The results suggest conformity with the theory that large banks are more efficient than small banks, and if they were statistically significant they would be consistent with similar studies that report findings supportive of the theory (Berger and Humphrey, 1997).

(ii) Profit Efficiency

Panel B reports that small banks are marginally more profit efficient than large banks in the period under investigation. Profit efficiency averaged 53.77% for small banks in the period under examination while for large banks it was 53.20%. The results may be interpreted to mean that the estimated profits earned by small banks are only 53.77% of those earned by the best practice bank while for the large banks it is slightly lower at 53.20%. Differences between large and small bank efficiencies are minimal and therefore statistically insignificant for all the years analyzed. For both large and small banks profit efficiency is lower than cost efficiency. This is an indication that banks find it easier to control costs than to generate profits. Cost efficiency is generally more beneficial to consumers than to shareholders, while the reverse is true for profit efficiency.

The profit efficiency results are not supportive of the theory that large banks are more efficient than small banks. The small banks category also comprises some large banks that took over fairly small banks. The profit efficiencies of the large banks included in the small bank category tipped the overall efficiency in favour of that group. These results would probably have been different if the median value approach applied by Al-Sharkas *et al*. (2008) had been feasible for using in this study. Another approach would have been to follow Campa and Hernando (2006) who partitioned their sample by taking the upper and lower quartiles based on joint (bidder and target) market capitalization (total assets instead).

5.2.1.8 Large Bidders and Targets

(i) Cost Efficiency

Table 5.10 reports the efficiencies of large bidders and their targets. Panel A shows that targets are more cost efficient than bidders. With a cost efficiency of 72.12%, the targets waste 27.88% of their resources to produce the same services produced by the best practice bank under similar conditions, while with an efficiency of 70.35% bidders waste 29.65% of theirs for the same results. Targets' cost efficiency exceeds that of the bidders in five of the seven years analyzed, but none of the yearly differences are statistically significant.

These results are not supportive of the theory that bidders target less efficient banks. If they were statistically significant, they would be consistent with the outcomes of studies that have reported similar findings (Huizinga *et al*., 2001).

(ii) Profit Efficiency

In Panel B, at 54.69% the bidders' profit efficiency is shown to be slightly greater than that of the targets which is 51.72%. Bidder efficiency exceeds that of the targets in every year except one in the period analyzed. However, none of the yearly efficiency differences between the bidders and the targets is statistically significant. The results are interpreted to mean that bidders generate only 54.69% of the profits realized by the best practice bank operating under similar conditions, while targets generate only 51.72%. The overall results show that targets are better at controlling costs than at generating income, while the reverse is true for the bidders. Upon merger, the combined firm might focus more on raising the level of profits through a superior management in order to enhance shareholder wealth. This might have been the motive for the merger in the first place.

These results conform to what the theory states that bidders are more efficient than targets. If they were statistically significant, they would be consisted with the findings reported by studies that have examined the pre-merger profit efficiency (Beitel *et al*., 2004).

5.2.1.9 Small Bidders and Targets

(i) Cost Efficiency

The efficiencies of small bidders and their targets are reported in Table 5.11. Panel A shows that targets are marginally more cost efficient than the bidders, and for five of the seven years that were analyzed target efficiency is greater than bidder efficiency. However, none of the efficiency differences between bidder and target are statistically significant. The target efficiency of 70.66% may be interpreted to mean that targets waste 29.34% of their resources to offer the same services the best practice bank does, while bidders waste 29.98%. These results are similar to those of the large bidders and their targets where, as reported above, the targets' cost efficiency also marginally exceeds that of the bidders.

These results differ with theory as bidders should be more cost efficient than targets in conformity with Hypothesis 1. If they were statistically significant, they would be consistent with the findings of some studies that have reported similar results (Resti, 1998).

(ii) Profit Efficiency

In Panel B bidders are shown to be more profit efficient than targets. At 55.20% bidder efficiency may be interpreted to mean that this is the percentage of profits a bidder may generate compared to those realized by the best practice bank operating under similar conditions. For targets it is 51.95%. Bidder efficiency is greater than target efficiency for most of the years analyzed, although the yearly differences between the two are not statistically significant. Taken together with the cost efficiency results, a picture emerges of more profitable bidders taking over targets that are better at controlling costs, maybe with the aim of improving profitability for the advantage of shareholders, while at the same time maintaining cost efficiency for the benefit of consumers.

Save for lack of statistical significance, these results are supportive of the theory that bidders are more efficient than targets, and consistent with the findings of those studies that have investigated profit efficiency (Beitel *et al*., 2004).

5.2.1.10 WEE and CEE Bidders and Targets

Cost Efficiency

Table 5.12 presents the results of the efficiencies of WEE bidders and CEE targets. Panel A shows that targets are marginally more cost efficient than the bidders but the difference is not statistically significant. The results mean that targets waste 27.26% of their resources to provide the same services as the best practice bank while bidders waste slightly more, 27.81%. There is no consistent rise or fall in either cost or profit efficiency during the period examined.

These results are not in conformity with the theory that bidders are more efficient than targets, as pointed out variously in preceding paragraphs. They instead support the view that WEE banks target efficient CEE institutions, and if they were statistically significant they would be consistent with the findings of studies that have examined this hypothesis (Lanine and Vennet, 2007).

Profit Efficiency

Panel B of Table 5.12 shows the opposite results to cost efficiency with bidders more profit efficient than the targets, although the difference between the two is not statistically significant. The results mean bidders can generate 55.50% of those profits achieved by the best practice bank operating under similar conditions, while targets can generate a little less at 53.23%. In this case also there does not appear to be a trend in either cost or profit efficiency performance in the period examined.

In apparent conformity with theory, these results show that bidders are more profit efficient than targets, and would be consistent with Beitel et *al*. (2004) if they were statistically significant. On the other hand, the results contradict the hypothesis that WEE institutions target efficient CEE banks, as reported by Lanine and Vennet (2007). In the absence of significant results in the differences between the efficiencies of WEE and CEE firms, we cannot reject the hypothesis that WEE and the CEE banks have similar cost and profit efficiency levels.

5.2.2 Post-merger Performance

In this section the intention is to see whether efficiency improves after merger. Often the reason given for merger is to improve performance in order to enhance shareholder wealth. Since efficiency is a performance measure widely used for this purpose, pre-merger efficiency is compared to that of the first, second and third years after merger to determine whether there is improvement post-merger as often anticipated. To be able to compare efficiency for the two periods, the pre-merger efficiencies of the bidder and target are weighted using their total assets pre-merger, resulting in a sum which is then used as the pre-merger efficiency estimate of the combined firm. As before, the sample is also partitioned and pre-merger and post-merger efficiencies estimated. Before looking at the results, it is useful to consider a few relevant hypotheses.

Hypotheses of Interest

There are several basic hypotheses on effects of bank mergers in the literature, the main ones being those which predict performance improvement after merger. It is argued that upon merger the resulting firm is larger than either of the previous institutions and can therefore benefit from economies of scale and scope not achievable before. Unit costs can be reduced and more products can be offered by sharing inputs which were underutilized previously (Berger *et al*., 1999). Such benefits may lead to improved efficiency (Copeland *et al*., 2003). In a comparison of post-merger efficiency, Al-Sharkas *et al*. (2008) find that merged banks improve in cost efficiency in two of the three years reported, while their peers improve in only one. Merged banks improve in profit efficiency in all the three years, but again the peers improve in only one. Huizinga *et al*. (2001) also find that merged banks improve in cost efficiency while their peers do not. However, profit efficiency declines for the combined bank, while peer efficiency is not reported.

The above discussion leads to the following hypothesis:

Hypothesis 1: Bank mergers lead to post-merger improvement in efficiency as a result of achieving scale and scope economies.

It has been suggested that post-merger improvement occurs when an efficient firm takes over a less efficient one. Berger and Humphrey (1992), for example, find that efficiency improves post-merger when a less efficient firm is taken over by a best practice bank which then institutes best practices throughout the new entity. However, as it is with most performance issues on bank mergers, findings of studies on post-merger efficiency done using 1980s data are inconclusive. Many conclude that bank mergers did not lead to improvement in efficiency post-merger (Cornett and Tehranian, 1992), while others find that after merger the new firm is preoccupied with cost cuts and not in improvement of profitability (Houston *et al*., 2001).

The above discussion leads to the following hypothesis:
Hypothesis 2: There are post-merger gains in efficiency when a more efficient bank takes over a less efficient one.

Quite often, the best practice banks also happen to be the large. If this is so, it means that a merger between large banks will lead to improved efficiency after merger since the consolidation brings together two banks with the relevant experience to bring about the desired performance. On the other hand, if two large banks merge the combined bank will face the inevitable task of integrating two large systems, which can be costly in the first few years of merger. As a result, cost efficiency might decline after merger, but it has been observed that although this may happen, and contrary to Houston *et al*. (2001), it can sometimes be offset by gains in profitability (Pilloff, 1996).

The above discussion leads to the following hypothesis:
Hypothesis 3: Large mergers will improve in profit efficiency post-merger but cost efficiency will take some time to improve.

Small banks might not be as efficient as the large and therefore improvement in efficiency following merger between small banks might be less assured than that expected in large-bank mergers. But small mergers may face fewer integration challenges and therefore experience efficiency improvements just as large bank mergers. In their comparison of the post-merger efficiency of small and large mergers, Al-Sharkas *et al*. (2008) find greater cost efficiency

improvement in small mergers than they find in large mergers. On the other hand, large mergers are found to gain in profit efficiency considerably more than the small mergers.

The above discussion leads to the following hypothesis:
Hypothesis 4: Small mergers improve in cost efficiency post-merger and to a lesser extent in profit efficiency.

Cross-border mergers may be expected to improve efficiency because that may be one of the reasons of the target accepting to merge with a foreign rather than a domestic bank. Also, banks venturing overseas may be expected to be more efficient than their domestic counterparts, and presumably better prepared to face the challenges that international expansion poses. Most cross-border bidders come from the developed regions of the world. They reside in more advanced capital systems and are expected to introduce better technologies upon merging with banks from other regions to improve performance.

On the other hand, a decline in performance may be expected, especially in the first few years after merger, considering all the barriers that may exist in going abroad, including language, culture, and the initial difficulties of operating in a different regulatory environment. This may cause post-merger performance to be either insignificant or negative (Poghosyan and Borovicka, 2006). Even transfer of know-how may take time. In their recent study, Hagendorff and Keasey (2008) find that it takes three years for performance gains to be realized in cross-border mergers.

The above discussion leads to the following hypotheses:
Hypothesis 5: Cross-border mergers lead to improved efficiency because the bidder introduces superior managerial skills and technology in the combined firm.

Hypothesis 6: Cross-border mergers will not lead to improved efficiency immediately after merger, as it may take time to overcome various barriers and for integration of new advanced systems and know-how into the combined firm.

Some studies have investigated post-merger performance in banking and found that it takes some years before performance can improve. Cuesta and Orea (2001) suggest that it may take between eight and ten years before merged banks can show any improvements in efficiency attributable to the merger. The recent study of Hagendorff and Keasey (2008) finds evidence that European banks embark on a cost-cutting strategy in the first three years immediately following merger.

The above discussion leads to the following hypothesis:
Hypothesis 7: There may not be efficiency improvements in merged banks in the first few years following merger as the new bank deals with integration issues.

WEE banks are found to target large efficient CEE banks (Lanine and Vennet, 2007). At the same time, some studies find that foreign banks outperform domestic banks in the CEE region (Fries and Taci, 2005; Yildirim and Philippatos, 2007). Bonin *et al*. (2005) find that a bank's cost efficiency in the CEE countries is positively associated with foreign ownership. But there are also studies that do not find evidence of significant impact of foreign ownership in the performance of CEE banks (Poghosyan and Borovicka, 2006).

The above discussion leads to the following hypothesis:
Hypothesis 8: There are post-merger efficiency improvements in WEE banks that have merged with CEE banks because both bidder and target are expected to be large and efficient pre-merger.

5.2.2.1 Post-2001 Performance of Mergers and Peers[17]

Table 5.13 summarizes the post-merger efficiency estimates of mergers that took place in 2001 and the respective peers for the first, second, and third years after merger.

The results show a decline in both cost and profit efficiency one year after merger for the merged banks but improvement in both efficiencies for the peers. The decline in profit efficiency for the merged banks is statistically significant at the 5% level, while the other results are not. The results also show a drop in cost efficiency two years after merger for both the merged banks and

[17] The Wilcoxon Signed Rank Test was used for testing statistical significance between pre-merger and post-merger efficiency.

the peers. Profit efficiency declines for the merged banks but improves for the peers. However, none of the results are statistically significant. Three years after merger, once again the results show a decline in cost efficiency for the merged firms, which is statistically significant at the 5% level. Peers' cost efficiency improves but not significantly. Regarding profit efficiency, it declines for both the merged banks and the peers but not significantly.

Overall, there is no definitive improvement for merged banks in either cost or profit efficiency in the first three years following merger. The results are inconsistent with Hypothesis 1 which suggests improved efficiency for achieving scale and scope economies. Improvement may be achieved after a while, consistent with Hypothesis 7. The results differ from those reported by Al-*Sharkas et al*. (2008), presumably due to the smallness of the sample (20 mergers) used in this analysis.

5.2.2.2 Post-2002 Performance of Mergers and Peers

Table 5.14 summarizes the post-merger efficiency estimates of mergers that took place in 2002 and the respective peers for the first, second, and third years after merger.

The results show a decline in cost efficiency for merged banks but an improvement for peers one year after merger. However, neither change in efficiency is statistically significant. As for profit efficiency, there is an improvement for the merged banks but a decline for the peers. Again, neither change is statistically significant. Two years after merger there is a decline in cost efficiency for both the merged banks and the peers. As before, profit efficiency improves for the merged banks, but declines for the peers. None of the efficiency changes are statistically significant. Three years after merger there is a decline in cost efficiency for the merged firms and a minimal improvement for the peers. For the third time the results show improvement in profit efficiency for the merged banks but a decline for the peers. Profit efficiency improvement is statistically significant at the 10% level.

The main result is that the merged banks improved profit efficiency in all the three years after merger although only the third year result is statistically significant. Cost efficiency

improvements may be delayed as the banks pursue integration issues, consistent with Hypothesis 7. The results are consistent with those of Diaz *et al*. (2004) who find evidence of profitability improvement post-merger.

5.2.2.3 Post-2003 Performance of Mergers and Peers

Table 5.15 summarizes the post-merger efficiency estimates of mergers that took place in 2003 and the respective peers for the first, second, and third years after merger.

The results show that one year after consolidation merged banks experience a decline in cost efficiency while peers gain. As for profit efficiency, both merged banks and peers gain, and the merged banks' results are statistically significant at the 5% level. Two years after merger merged banks gain in cost efficiency but peers suffer a decline, as they both gain in profit efficiency. The merged banks' profit efficiency results are statistically significant at the 10% level. Three years after merger there are gains in both cost and profit efficiency for both merged banks and peers. The results are, however, not statistically significant.

Overall, for mergers that took place in 2003, merged banks gain in cost efficiency after both two and three years and gain in profit efficiency in all the three years. However, the findings are statistically significant for only profit efficiency, and only for two of the three years. Peer performance is as good as that of the merged banks. This is an indication that the efficiency gains may have been the result of economy-wide conditions and therefore not attributable to the mergers alone. The results are not quite consistent with Hypothesis 1 which suggests efficiency improvements on achieving economies of scale and scope. On the other hand, there is strong indication for consistency with studies that report gains in post-merger profitability (Pilloff, 1996).

5.2.2.4 Post-2001 Performance of Cross-border and Domestic Mergers

Table 5.16 summarizes the post-merger efficiency estimates of mergers that took place in 2001 for the first, second, and third years after merger.

One year after merger both cross-border and domestic merger banks experience a decline in both cost and profit efficiencies. The drop in profit efficiency for the domestic banks is statistically significant at the 10% level. Also, two years after merger both cross-border and domestic mergers once again experience a decline in both cost and profit efficiency, although none of the results are statistically significant. Post-merger cost efficiency once again shows a decline for both cross-border and domestic banks three years into merger. On the other hand, cross-border banks gain in profit efficiency while domestic banks lose. However, none of the results are statistically significant.

Overall, the results show that banks engaged in domestic and cross-border mergers in 2001 did not improve in cost or profit efficiency in the first three years following merger. The results are consistent with Hypothesis 7 which suggests that improvements may not be realized in the first few years after merger, and if they were statistically significant they would be consistent with the findings of Cuesta and Orea (2001) and Hagendorff and Keasey (2008).

5.2.2.5 Post-2002 Performance of Cross-border and Domestic Mergers

Table 5.17 summarizes the post-merger efficiency estimates of mergers that took place in 2002 for the first, second, and third years after merger.

The results show a decline in cost efficiency for both cross-border and domestic merger banks one year after merger. On the other hand, there is improvement in profit efficiency for both categories of banks. However, none of the results are statistically significant. Two years following merger there is a gain in cost efficiency for the cross-border merger banks, but domestic merger banks once again record a decline. As for profit efficiency, cross-border merger banks record a decline while domestic merger banks continue to gain. However, none of the efficiency changes are statistically significant. In the third year after merger cross-border merger banks once again record a gain in cost efficiency, while domestic merger banks continue to suffer loss in cost efficiency. In profit efficiency, both cross-border and domestic merger banks gain. The results for the domestic banks are both statistically significant at the 10% level.

Overall domestic mergers demonstrate superior performance by gaining in profit efficiency in all the three years after merger. However, only one of the three results is statistically significant, at 10%. Also, they lose in cost efficiency in all the three years. Cross-border mergers gain in both cost and profit efficiencies in two of the three-year mergers. However, without enough statistically significant results, the findings are consistent with Hypothesis 7 which suggests that cross-border mergers may not realize efficiency improvements in the first few years after merger due to the many challenges a bank faces of integrating with an overseas firm. If some of those challenges were cultural barriers and regulatory restrictions, and if the results were statistically significant, they would be consistent with those of Buch and DeLong (2002). And, save for inadequacy of statistical significance, the profit efficiency results for domestic mergers are consistent with the results reported by Campa and Hernando (2006) citing post-merger profitability gains.

5.2.2.6 Post-2003 Performance of Cross-border and Domestic Mergers

Table 5.18 summarizes the post-merger efficiency estimates of mergers that took place in 2003 for the first, second, and third years after merger.

Results show that one year after merger there is a decline in cost efficiency for both cross-border and domestic merger banks. On the other hand, both categories of banks gain in profit efficiency, the result for cross-border banks being statistically significant at the 10% level. Two years following merger cross-border merger banks gain in cost efficiency while domestic merger banks lose. However, both categories of banks gain again in profit efficiency. None of the results are statistically significant. In the third year after merger cross-border merger banks gain again in cost efficiency, while domestic merger banks continue to lose. On the other hand, both categories of banks gain in profit efficiency for the third consecutive year. However, none of the results are statistically significant.

Overall, domestic mergers gain in profit efficiency throughout the three years analyzed, while losing in cost efficiency in all the years. Cross-border merger banks perform quite well by gaining in profit efficiency in all the three years and in cost efficiency in two of the years

analyzed. These results are consistent with Hypothesis 1 but, for lack of adequate statistical significance, the findings do not constitute evidence for its support. With statistical significance, these results would be consistent with those studies that find improvement in post-merger profitability in domestic mergers (Resti and Siciliano, 2001) and in cross-border mergers (Elsas, *et al*., 2006).

5.2.2.7 Post-2001 Performance of Large Firms and Peers

Table 5.19 summarizes the post-merger efficiency estimates of mergers that took place in 2001 for the first, second, and third years after merger.

Following merger, large firms experience a decline in cost efficiency in the first year, while their peers gain in efficiency. In profit efficiency, performance change is negative for both merged banks and peers. However, none of the results are statistically significant. After two years, both large merged banks and their peers suffer a decline in cost efficiency, while, in profit efficiency, as large banks decline, their peers gain in efficiency. Nevertheless, none of the results are statistically significant. In the third year the results show a decline in both cost and profit efficiency for both merged banks and their peers. Again, however, none of the results are statistically significant.

Overall, the results indicate that large bank mergers that took place in 2001 did not improve in cost or profit efficiency in the first three years following merger. These results are not supportive of Hypothesis 3, which suggests that large firms gain in profit efficiency but cost efficiency improvements are delayed. The results are not consistent with the theory that large mergers will improve in profit efficiency but that cost efficiency will take some time to be realized. Instead, the results are supportive of the theory that it may take a while before efficiency may be realized after merger (Cuesta and Orea, 2001).

5.2.2.8 Post-2002 Performance of Large Firms and Peers

Table 5.20 summarizes the post-merger efficiency estimates of mergers that took place in 2002 for the first, second, and third years after merger.

The results show that one year after merger both large banks and their peers gain in cost efficiency. As for profit efficiency, the banks experience a decline while their peers gain. But, none of the results are statistically significant. In the second year after merger, the merged banks gain again in cost efficiency but their peers show a decline. With profit efficiency, there is a decline as in the first year for the merged banks while the peers continue to gain. However, none of the results are statistically significant. In the third year both the merged banks and their peers lose in cost efficiency, while both gain in profit efficiency. Nevertheless, none of the results are statistically significant.

Overall, the peers gain consistently in profit efficiency in the three years analyzed, while the other results lack consistency. These results are not supportive of Hypothesis 1 which suggests gains due to economies of scale and scope for merged banks. The results are suggestive of lack of merger-related performance improvement in the first few years after merger (Houston *et al*., 2001).

5.2.2.9 Post-2003 Performance of Large Firms and Peers

Table 5.21 summarizes the post-merger efficiency estimates of mergers that took place in 2003 for the first, second, and third years after merger.

First year results post-merger show a decline in the cost efficiency of the merged banks, while peers gain. On the other hand, both large firms and peers gain in profit efficiency. However, none of the results are statistically significant. In the second year, the merged banks experience a decline again in cost efficiency while the peers continue to gain. As for profit efficiency the merged banks continue to gain while the peers lose. The results are, nevertheless, not statistically significant. In the third year after merger, the cost efficiency of the merged banks declines while that of their peers increases. And, there is a decline for both merged banks and peers in profit efficiency. However, none of the results are statistically significant.

Overall, the peers show consistent improvement in cost efficiency, demonstrating that the merged banks were unable to gain in cost efficiency although they improved in profit efficiency in two of the three years analyzed. These results indicate consistency with Hypothesis 3 which suggests early improvement in profit efficiency and delayed improvement in cost efficiency, but, without statistical significance, the findings are not supportive of the hypothesis. The results may be compared to those of Pilloff (1996) in which it is suggested that the decline in cost efficiency is partly offset by gains in profitability.

5.2.2.10 Post-2001 Performance of Small Firms and Peers

Table 5.22 summarizes the post-merger efficiency estimates of mergers that took place in 2001 for the first, second, and third years after merger.

In the first year following merger, small merged banks show a decline in cost efficiency while peers gain. Similarly, merged bank profit efficiency declines as it improves for the peers. However, the results are not statistically significant. In the second year the first year performance is repeated, with the merged banks losing again in cost efficiency while the peers continue to gain. Meanwhile, there is a decline in profit efficiency for both the merged banks and the peers. None of the results, however, are statistically significant. In the third year, the merged banks continue to lose in cost efficiency, and in this year the peers also lose. And, both the merged banks and the peers experience a decline in profit efficiency. However, none of the results are statistically significant.

Overall, these results show that there is no post-merger improvement in either cost or profit efficiency and this applies to both the merged banks and the peers. The results are not consistent with Hypothesis 4 which proposes gains in cost efficiency and lesser gains in profit efficiency for small firm mergers. These results differ with those reported in Al-Sharkas *et al*. (2008) in which the small mergers gain in both cost and profit efficiency. In the light of the results discussed in Section 5.2.1.7 above, where small mergers are reported to be more profit efficient and nearly as cost efficient as large mergers, the hypothesis that the higher the pre-merger efficiency the less the post-merger improvement may apply in this case. In Akhavein *et al*.

(1997), profit efficiency is found to have improved post-merger, especially in those mergers where both bidder and target were rather inefficient pre-merger.

5.2.2.11 Post-2002 Performance of Small Firms and Peers

Table 5.23 summarizes the post-merger efficiency estimates of mergers that took place in 2002 for the first, second, and third years after merger.

In the first year after merger, the merged banks experience a decline in cost efficiency while their peers gain, but they both suffer loss in profit efficiency. However, none of the results are statistically significant. In the second year, there is a decline in cost efficiency for both the merged banks and their peers, while the small banks gain in profit efficiency as the peers lose. Nevertheless, none of the results are statistically significant. In the third year, cost efficiency in merged banks continues to decline while there is a gain for the peers. Merged banks gain in profit efficiency while the peers lose. However, none of the results are statistically significant.

Overall, there is a lack of consistency in the results. Since none of the results are statistically significant, it may be concluded that the desired improvement in efficiency was not realized. These results are not consistent with Hypothesis 4 which proposes gains in cost efficiency and lesser gains in profit efficiency for small bank mergers. In this case, as also reported above, lack of efficiency improvement may be attributed to the unlikelihood of immediate post-merger efficiency improvement where pre-merger efficiency was already considerably high.

5.2.2.12 Post-2003 Performance of Small Firms and Peers

Table 5.24 summarizes the post-merger efficiency estimates of mergers that took place in 2002 for the first, second, and third years after merger.

In the first year the merged banks gain in cost efficiency while the peers lose. Both the merged banks and the peers gain in profit efficiency. However, none of the results are statistically significant. The results show a gain in cost efficiency for both the merged banks and their peers in the second year. The results are similar in profit efficiency. But, none of the results are

statistically significant. In the third year, there is once again a gain in both cost and profit efficiency for both the merged banks and the peers. Once again, none of the results are statistically significant.

Overall, the results show a post-merger improvement in both cost and profit efficiency of both the merged banks and the peers. This suggests that the improvement cannot be attributed to the merger alone but also to economy-wide conditions. It is an indication, however, that by the third year of merger, involved banks have succeeded in overcoming integration challenges that can delay realization of cost efficiency improvement. These results indicate consistency with Hypothesis 1 which suggests that efficiency should improve as a result of realized economies of scale and scope. Nevertheless, in the absence of statistical significance, the findings are not supportive of the hypothesis. With statistical significance, they would be consistent with the findings of Cornett *et al*. (2006) regarding profitability, and with those of Beccalli and Frantz (2009) on cost efficiency.

5.2.2.13 Post-2001 Performance of WEE Merged Firms and Peers

Table 5.25 summarizes the post-merger efficiency estimates of mergers that took place in 2001 for the first, second, and third years after merger.

One year after merger, both merged banks and peers gain in cost efficiency, although the results are not statistically significant. Merged firms lose in profit efficiency while peers gain but again the results are not statistically significant. After two years of merger, once again both merged firms and peers gain in cost efficiency, although the results are not statistically significant. With similarly statistically insignificant results, both merged banks and peers lose in profit efficiency. Three years following merger both merged banks and peers lose in cost efficiency, but both gain in profit efficiency. However, none of the results are statistically significant.

Overall, the results are not consistent, but the gain in profit efficiency by the merged banks in the third year and cost efficiency gains in the first two years after merger indicate there is potential for efficiency improvement in coming years. The results are consistent with Hypothesis 6 which

suggests delayed efficiency improvements in cross-border mergers due to integration challenges. If they were statistically significant, the results would be consistent with the findings of Poghosyan and Borovicka (2006).

5.2.2.14 Post-2002 Performance of WEE Merged Firms and Peers

Table 5.26 summarizes the post-merger efficiency estimates of mergers that took place in 2002 for the first, second, and third years after merger.

One year after merger, merged banks lose in cost efficiency as peers gain, while in profit efficiency the merged banks gain as the peers lose, although none of the results are statistically significant. Both merged banks and peers gain in cost efficiency after two years of merger, but in profit efficiency only the peers gain while the merged banks lose. However, none of the results are statistically significant. After three years of merger, merged banks gain in cost efficiency but lose in profit efficiency, while peers lose in both. Once again, none of the results are statistically significant.

Overall, the results are not consistent. It is possible that upon merger the bidders engaged in investments requiring extensive outlay in order to reap benefits later. These results are supportive of Hypothesis 6 which suggests delayed efficiency improvements in cross-border mergers due to integration challenges. If they were statistically significant, they would be consistent with the findings of Hagendorff and Keasey (2008) who suggest that in the first three years after merger European banks pursue cost-cutting strategies.

5.2.2.15 Post-2003 Performance of WEE Merged Firms and Peers

Table 5.27 summarizes the post-merger efficiency estimates of mergers that took place in 2003 for the first, second, and third years after merger.

Merged banks lose in cost efficiency but gain in profit efficiency one year after merger. Peers, on the other hand, gain in cost efficiency but lose in profit efficiency. However, none of the results are statistically significant. After two years, merged banks gain in both cost and profit efficiency,

while peers lose in cost efficiency but gain in profit efficiency. However, none of the results are statistically significant. Both merged banks and peers gain in both cost efficiency and profit efficiency after three years of merger. Although none of the results are statistically significant, it is promising to note the improved performance by the merged banks.

Overall, merged bank performance is good, with profit efficiency improvements in all the three years and cost efficiency improvements in the second and the third years after merger. These results show consistency with Hypothesis 8 which suggests that WEE/CEE mergers should gain in efficiency as efficient bidders merge with efficient targets. With statistical significance, the results would be consistent with the findings of Lanine and Vennet (2007).

5.2.2.16 General Comments on the Results

A close examination of the results reveals that, irrespective of the year of merger, the third year after merger is on the average the one that produces most frequently positive gains in efficiency. This is an indication that it takes around that time for mergers to start showing post-merger performance improvements, which may then continue in the following years. Presumably, in the first two years after merger the combined firm dwells on integration issues, and is able to overcome most of its challenges and start operating profitably thereafter. It is noteworthy that it is profit efficiency in most of the cases that starts improving before cost efficiency. This suggests that profit efficiency is easier to improve than cost efficiency. Sometimes it is more difficult than earlier envisaged to implement all the cost savings planned pre-merger. It may also be an indication that the firm is engaged in investments that may promise sustained better performance in the future.

Most of the above results are not statistically significant. It is possible that this is mainly because of the small sample used for this study. In any case, they are an indication of performance improvement, only that the magnitudes achieved were too small to meet the statistical standards of significance. Regarding comparison with peers, especially where good performance is reported for them as well as the merged banks, the obvious interpretation is that the latter's performance cannot be attributed to the merger but to economy-wide conditions. At the same

time, consideration has to be taken into account that the peers did not have to go through the rigours of integration. Maybe the merged banks need credit for their performance despite the challenges of integration. In addition, it has been found that during a merger wave non-merging firms pursue internal efficiency-enhancing strategies, to avoid losing out to merging institutions which are known to seek to merge in order to improve efficiency (Evanoff and Ors, 2008).

5.3 Estimation of the Translog Function

Results of the cost frontier and profit frontier specifications are reported for the bidding banks, target banks, and their peers in Table 5.28, Table 5.29, and Table 5.30 respectively at Appendix 5.3.

Model Parameters

For both bidding banks and target banks, the coefficients of most of the estimated parameters have the expected sign for both the cost and profit functions. Also, with respect to the cost function, more than half of the coefficients are statistically significant. However, for the profit function less than half of them are statistically significant. As for peer banks, most of the coefficients of the estimated parameters have the expected sign for both the cost and profit functions. And, with respect to the cost function, about three quarters of the coefficients are statistically significant, while with respect to the profit function about two thirds are statistically significant. The coefficients for the interactive variables are proportionally as statistically significant as those for the first order and second order variables. For all the three categories of banks, and for both the cost and profit functions, σ^2 and γ are statistically significant. The coefficient of γ ranges from 0.965 to 0.998. These considerably high values indicate that most of the variation in the model estimation is due to the inefficiency error μ and not the random error υ.

Impact of Bank-specific and Country-specific Factors

Most of the coefficients of the bank-specific and country-specific variables are statistically significant for the three categories of banks analyzed.

Discussing first the bank-specific factors, with regard to the bidding and peer banks, the EQTA result suggests that the larger the proportion of assets financed by equity the less cost efficient a bank will be. This is expected since it means a smaller proportion of assets is left to be financed by loans, from which revenue is generated for running the bank. As for profit efficiency, in all the three categories of banks, the EQTA result indicates that the lower the proportion of assets financed by equity the less profit efficient a bank will be. This is unexpected since a low ratio means a greater proportion of loans whose revenue can boost profit efficiency. On the other hand, instances may arise where in place of loans a larger share of assets is financed by non-equity share capital. The LOANDEP result for the cost function shows that as the ratio increases so too does cost efficiency for the bidding banks. This supports the view that a larger proportion of funding by loans is good for the efficiency of the bank. The result for the target banks leads to the opposite conclusion. In theory, this is not to be expected, but situations could arise where the LOANDEP ratio is so high that little room is left for investment in readily marketable securities which are essential for maintaining an acceptable margin of liquidity.

As for the country-specific factors, the CONCT result for the cost efficiency function for all the three categories of banks concentration has a positive effect on efficiency. The opposite is true for the profit function. In theory, it should be possible in a concentrated market for the largest banks to offer lower deposit rates and charge higher rates of interest on loans or issue numerous loans at market rates. CONCT should therefore have a positive effect on profit efficiency (Prager and Hannan, 1998). However, this is not always the case (Shafer, 1989). Overall, INFL has a positive and significant effect on cost inefficiency as expected for all the three categories of banks. The result for profit efficiency is not conclusive. The result for cost efficiency is consistent with that of Kasman and Yildrim (2006). For both bidding and target banks the GDPRT result has the expected sign indicating that firms in growing markets improve in both cost and profit efficiency. Similar results were obtained by Maudos *et al*. (2002). With respect to stock market development, the MACGDP result for all the three categories of banks has a positive effect on both cost and profit efficiency as expected. A developed stock market is typically characterized by more efficient firms. The results show that vibrancy of the banking sector as measured by CLAIMS has a positive effect on both cost and profit efficiency as

expected. These results are consistent with those of Pasiouras *et al*. (2009). The results show that despite the imposition of capital requirements, CAPRQ has a positive effect on cost efficiency for both bidding and target banks which is, however, not matched by a similar outcome on profit efficiency. This result is consistent with the suggestion that regulatory restrictions deny banks the flexibility needed for them to operate efficiently (Barth *et al*. 2004). It is not surprising therefore that positive cost efficiency results do not translate into profit efficiency as desired.

5.4 Discussion and Conclusions

In this chapter, cost and profit efficiencies are estimated for the full sample and a number of sub-samples. Pre-merger efficiency is estimated first to compare the merging banks' performance before merger with that of their peers, before similar comparisons are made between the efficiencies of bidders and targets, cross-border mergers and domestic deals, and analyses of a few other sub-samples. In the second part of the analysis, pre-merger efficiency of the combined firm, adjusted appropriately, is compared with post-merger efficiency one, two, and three years after merger.

The main results are that with regard to the full sample, in both cost and profit efficiency the peers perform better than the merged banks pre-merger. Regarding post-merger performance, for mergers that took place in 2001, there is no notable improvement in efficiency in the first three years. For the mergers that took place in 2002, there is improvement in profit efficiency in the first three years after merger. And for those mergers that occurred in 2003, there are again improvements in profit efficiency in the first three years after merger.

In the sub-sample of Cross-border and Domestic bidders, the Cross-border bidders perform better pre-merger in both cost and profit efficiency. As for post-merger performance, for mergers that took place in 2001, overall neither the Cross-border nor the Domestic bidders improved in efficiency in the first three years after merger. For mergers that took place in 2002, Domestic bidders outperform the Cross-border bidders, especially in profit efficiency in which they improve in each of the first three years after merger. However, Domestic bidders lose in cost efficiency in all the three years. The Cross-border bidders improve in two years and lose in one

year in both cost and profit efficiency. And for the mergers that took place in 2003, Cross-border bidders perform well by gaining in profit efficiency in all the three years after merger, and gaining in cost efficiency in two of those years. Domestic bidders also gain in profit efficiency in all the three years, but lose in cost efficiency also in all the three years.

It can be concluded from the above discussion that post-merger performance improvement is more likely to be realized in profit efficiency than in cost efficiency. This may not be surprising since profit efficiency is associated more with shareholder wealth creation than cost efficiency, which is viewed as more beneficial to customers of bank services.

Following the above results, the next chapter uses them together with those obtained in Chapter Three to carry out an analysis designed to determine whether bank efficiency information is taken into account by the market as it reacts to merger announcements.

5.5 Appendix 5.1: Pre-merger Cost and Profit Efficiency

Table 5.3 Pre-merger Cost and Profit Efficiency of Merged and Non-merged Banks[18]

Year	Merged Banks		Non-merged Banks		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7433	0.0964	0.7595	0.0820	-0.0162	-0.57	0.58
2002	0.6948	0.0607	0.7572	0.0781	-0.0624	-3.47	0.00*
2003	0.6796	0.0305	0.7620	0.0814	-0.0824	-8.68	0.00*
2004	0.6941	0.0437	0.7444	0.0789	-0.0503	-3.53	0.00*
2005	0.7032	0.0830	0.7665	0.0832	-0.0632	-3.17	0.00*
2006	0.7019	0.0674	0.7527	0.0766	-0.0508	-3.85	0.00*
2007	0.7467	0.1003	0.7562	0.0739	-0.0095	-0.32	0.75
2001-2007	0.7079	0.0743	0.7567	0.0798	-0.0488	-6.56	0.00*
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5537	0.0613	0.7696	0.1553	-0.1759	-8.71	0.00*
2002	0.5357	0.0581	0.7503	0.1489	-0.2146	-11.67	0.00*
2003	0.5121	0.0636	0.7198	0.1918	-0.2077	-10.30	0.00*
2004	0.5650	0.1493	0.7333	0.1903	-0.1683	-3.51	0.00*
2005	0.5696	0.1194	0.7065	0.1958	-0.1369	-4.64	0.00*
2006	0.5363	0.0704	0.7699	0.1758	-0.2335	-15.13	0.00*
2007	0.4576	0.1096	0.7510	0.1831	-0.2934	-8.62	0.00*
2001-2007	0.5349	0.0958	0.7359	0.1816	-0.2010	-20.14	0.00*

Note: *Significant at the 5% level.

[18] All banks not engaged in mergers from countries covered by this study were selected as peers. A total of 2899 non-merged banks were selected. Peers were selected only in those years when at least one bank was involved in a merger.

Table 5.4 Pre-merger Cost and Profit Efficiency of Merged and Non-merged Banks[19]

Year	Merged Banks		Non-merged Banks		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7433	0.0964	0.7367	0.0818	0.0066	0.18	0.86
2002	0.6948	0.0607	0.7822	0.0947	-0.0874	-2.69	0.01*
2003	0.6796	0.0305	0.7584	0.0701	-0.0788	-3.57	0.00*
2004	0.6941	0.0437	0.7478	0.0853	-0.0537	-1.77	0.10
2005	0.7032	0.0830	0.7667	0.0652	-0.0634	-2.55	0.02*
2006	0.7019	0.0674	0.7721	0.0922	-0.0702	-3.25	0.00*
2007	0.7467	0.1003	0.7401	0.0418	0.0066	0.21	0.84
2001-2007	0.7079	0.0743	0.7606	0.0786	-0.0527	-4.97	0.00*
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5537	0.0613	0.6891	0.1299	-0.1354	-3.27	0.00*
2002	0.5357	0.0581	0.7834	0.1748	-0.2478	-4.66	0.00*
2003	0.5121	0.0636	0.7135	0.1721	-0.2015	-3.80	0.00*
2004	0.5650	0.1493	0.7325	0.1760	-0.1675	-2.29	0.03*
2005	0.5696	0.1194	0.7043	0.1818	-0.1347	-2.63	0.01*
2006	0.5363	0.0704	0.6974	0.1502	-0.1611	-5.14	0.00*
2007	0.4576	0.1096	0.7212	0.1265	-0.2636	-5.45	0.00*
2001-2007	0.5349	0.0958	0.7156	0.1574	-0.1807	-10.00	0.00*

Note: *Significant at the 5% level.

[19] Peers were selected on the basis of bidder and target size. Therefore, a total of 112 non-merged banks were selected.

Table 5.5 Pre-merger Cost and Profit Efficiency of Bidder and Target Banks

Year	Bidder Banks		Target Banks		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7142	0.0671	0.7724	0.1180	-0.0581	-1.05	0.32
2002	0.7139	0.0825	0.6757	0.0207	0.0383	1.10	0.31
2003	0.6653	0.0091	0.6938	0.0384	-0.0285	-1.77	0.13
2004	0.6732	0.0284	0.7150	0.0490	-0.0418	-1.65	0.15
2005	0.7162	0.1177	0.6903	0.0198	0.0259	0.65	0.53
2006	0.7087	0.0933	0.6950	0.0252	0.0136	0.53	0.61
2007	0.7009	0.0642	0.7925	0.1189	-0.0916	-1.72	0.13
2001-2007	0.7019	0.0786	0.7139	0.0700	-0.0120	-0.82	0.41
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5798	0.0207	0.5276	0.0787	0.0523	1.57	0.17
2002	0.5083	0.0672	0.5631	0.0333	-0.0548	-1.79	0.12
2003	0.5065	0.0705	0.5176	0.0622	-0.0111	-0.29	0.78
2004	0.6225	0.1942	0.5075	0.0645	0.1150	1.26	0.26
2005	0.6017	0.1513	0.5376	0.0714	0.0641	1.15	0.27
2006	0.5462	0.0273	0.5264	0.0966	0.0198	0.74	0.47
2007	0.5001	0.0685	0.4152	0.1320	0.0849	1.40	0.20
2001-2007	0.5527	0.0990	0.5171	0.0889	0.0357	1.93	0.06**

Note: **Significant at the 10% level.

Table 5.6 Pre-merger Cost and Profit Efficiency of Cross-border and Domestic Bidder Banks

Year	Cross-border Bidders		Domestic Bidders		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.6782	0.0237	0.7323	0.0775	-0.0540	-1.28	0.27
2002	0.7495	0.1440	0.6961	0.0563	0.0534	0.51	0.70
2003	0.6657	0.0101	0.6665	0.0048	0.0008	1.14	0.90
2004	0.6732	0.0284	0.6699	0.0173	0.0033	1.19	0.85
2005	0.7441	0.1390	0.6603	0.0084	0.0839	1.47	0.20
2006	0.7182	0.1040	0.6735	0.0124	0.0448	1.39	0.19
2007	0.6904	0.0337	0.7114	0.0767	-0.0210	-0.43	0.69
2001-2007	0.7055	0.0891	0.6951	0.0554	0.0104	0.52	0.61
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5741	0.0238	0.5827	0.0223	-0.0085	-0.42	0.71
2002	0.4984	0.0860	0.5132	0.0704	-0.0148	-0.21	0.85
2003	0.5240	0.0626	0.4191	0.0898	0.1049	0.60	0.66
2004	0.6225	0.2475	0.5463	0.0614	0.0762	1.14	0.21
2005	0.6305	0.1805	0.5439	0.0512	0.0866	1.09	0.32
2006	0.5457	0.0303	0.5481	0.0156	-0.0025	-0.19	0.85
2007	0.4805	0.0862	0.5196	0.0561	-0.0392	-0.66	0.56
2001-2007	0.5619	0.1163	0.5354	0.0565	0.0265	1.10	0.28

Table 5.7 Pre-merger Cost and Profit Efficiency of Cross-border Bidder and Target Banks

Year	Cross-border Bidders		Cross-border Targets		Difference		
	Mean	Stdev	Mean	Stdev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.6782	0.0237	0.8153	0.0884	-0.1371	-2.12	0.28
2002	0.7495	0.1440	0.6830	0.0357	0.0665	0.63	0.64
2003	0.6657	0.0101	0.7004	0.0390	-0.0347	-1.93	0.11
2004	0.6732	0.0284	0.7150	0.0490	-0.0418	-1.65	0.15
2005	0.7441	0.1390	0.6847	0.0161	0.0594	1.04	0.35
2006	0.7182	0.1040	0.6977	0.0271	0.0205	0.63	0.54
2007	0.6904	0.0337	0.8001	0.1683	-0.1097	-1.11	0.38
2001-2007	0.7055	0.0891	0.7135	0.0660	-0.0080	-0.42	0.68
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5741	0.0238	0.5547	0.0342	0.0194	0.66	0.58
2002	0.4984	0.0860	0.5379	0.0286	-0.0395	-0.62	0.65
2003	0.5240	0.0626	0.5018	0.0544	0.0221	0.60	0.57
2004	0.6225	0.2475	0.5075	0.0645	0.1150	1.26	0.26
2005	0.6305	0.1805	0.5186	0.0813	0.1119	1.38	0.21
2006	0.5457	0.0303	0.5466	0.0937	-0.0009	-0.03	0.98
2007	0.4805	0.0862	0.5106	0.1158	-0.0301	-.36	0.74
2001-2007	0.5619	0.1163	0.5261	0.0760	0.0358	1.50	0.14

Table 5.8 Pre-merger Cost and Profit Efficiency of Domestic Bidder and Target Banks

Year	Domestic Bidders		Domestic Targets		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7323	0.0775	0.7509	0.1369	-0.0186	-0.24	0.82
2002	0.6961	0.0563	0.6720	0.0153	0.0241	0.83	0.47
2003	0.6665	0.0048	0.6844	0.0333	-0.0179	-0.75	0.59
2004	0.6699	0.0173	0.0692	0.0259	0.0107	0.62	0.51
2005	0.6603	0.0084	0.7180	0.0087	-0.0577	-8.29	0.00*
2006	0.6735	0.0124	0.6852	0.0166	-0.0117	-0.98	0.38
2007	0.7114	0.0767	0.7850	0.0828	-0.0735	-1.13	0.32
2001-2007	0.6951	0.0554	0.7176	0.0783	-.0225	-0.99	0.33
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5827	0.0223	0.5140	0.0958	0.0687	1.40	0.26
2002	0.5132	0.0704	0.5757	0.0307	-0.0625	-1.63	0.18
2003	0.4191	0.0898	0.5750	0.0306	-0.0924	-1.38	0.40
2004	0.5463	0.0614	0.4804	0.0791	0.0659	1.31	0.34
2005	0.5439	0.0512	0.5641	0.0093	-0.0202	-0.67	0.57
2006	0.5481	0.0156	0.4521	0.0791	0.0959	2.06	0.18
2007	0.5196	0.0561	0.3198	0.0537	0.1998	4.46	0.01*
2001-2007	0.5354	0.0565	0.4980	0.1080	0.0374	1.30	0.20

Note: *Significant at the 5% level.

Table 5.9 Pre-merger Cost and Profit Efficiency of Large and Small Merged Banks

Year	Large Banks		Small Banks		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7434	0.0835	0.7432	0.1160	0.0002	0.00	0.99
2002	0.6662	0.0257	0.7005	0.0649	-0.0343	-1.25	0.28
2003	0.6800	0.0158	0.6794	0.0424	0.0006	0.02	0.98
2004	0.6887	0.0279	0.7021	0.0655	-0.0134	-0.39	0.72
2005	0.7289	0.1346	0.6904	0.0431	0.0385	0.68	0.52
2006	0.6935	0.0481	0.7168	0.0942	-0.0233	-0.73	0.48
2007	0.7728	0.1152	0.6944	0.0215	0.0784	1.86	0.10
2001-2007	0.7124	0.0793	0.7035	0.0695	0.0089	0.61	0.54
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5740	0.0259	0.5334	0.0812	0.0406	1.16	0.29
2002	0.5662	0.0097	0.5296	0.0622	0.0366	1.76	0.11
2003	0.5219	0.0478	0.5022	0.0780	0.0197	0.52	0.62
2004	0.5264	0.0613	0.6229	0.2306	-0.0965	-0.82	0.47
2005	0.5521	0.0554	0.5784	0.1428	-0.0163	-0.56	0.58
2006	0.5469	0.0750	0.5173	0.0600	0.0296	1.14	0.27
2007	0.4554	0.1076	0.4620	0.1304	-0.0066	-0.09	0.93
2001-2007	0.5320	0.0757	0.5377	0.1130	-0.0057	-0.30	0.76

Table 5.10 Pre-merger Cost and Profit Efficiency of Large Bank Bidders and Large Bank Targets

Year	Large Bidders		Large Targets		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7181	0.0712	0.7685	0.1024	-0.0503	-.070	0.52
2002	0.6480	0.0115	0.6843	0.0157	-0.0363	-1.65	0.17
2003	0.6709	0.0089	0.6886	0.0175	-0.0177	-1.56	0.22
2004	0.6849	0.0316	0.6926	0.0301	-0.0078	-0.31	0.77
2005	0.7712	0.1973	0.6867	0.0323	0.0845	0.73	0.54
2006	0.6972	0.0650	0.6899	0.0257	0.0073	0.31	0.76
2007	0.7085	0.0662	0.8372	0.1245	-0.1288	-1.83	0.13
2001-2007	0.7035	0.0798	0.7212	0.793	-0.0177	-0.80	0.43
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5832	0.0231	0.5646	0.0296	0.0187	0.86	0.44
2002	0.5594	0.0072	0.5731	0.0198	-0.0138	0.89	0.47
2003	0.5409	0.0208	0.5029	0.0647	0.0380	0.97	0.43
2004	0.5491	0.0623	0.5036	0.0628	0.0455	0.89	0.42
2005	0.5613	0.0616	0.5429	0.0602	0.0184	0.37	0.73
2006	0.5498	0.0320	0.5440	0.1045	0.0058	0.16	0.88
2007	0.5021	0.0792	0.4088	0.1222	0.0933	1.28	0.26
2001-2007	0.5469	0.0479	0.5172	0.0946	0.0297	1.43	0.16

Table 5.11 Pre-merger Cost and Profit Efficiency of Small Bank Bidders and Targets

Year	Small Bidders		Small Targets		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.7103	0.0783	0.7762	0.1558	-0.0659	-0.65	0.56
2002	0.7271	0.0849	0.6739	0.0226	0.0531	1.35	0.23
2003	0.6597	0.0059	0.6990	0.0575	-0.394	-1.18	0.36
2004	0.6557	0.0141	0.7485	0.0636	-0.0928	-2.02	0.29
2005	0.6887	0.0622	0.6921	0.0141	-0.0034	-0.13	0.90
2006	0.7293	0.1378	0.7043	0.0239	0.0250	0.40	0.71
2007	0.6858	0.0293	0.7031	0.0152	-0.0173	-0.74	0.54
2001-2007	0.7002	0.0789	0.7066	0.0599	-0.0064	-0.33	0.74
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5763	0.0224	0.4905	0.1023	0.0858	1.42	0.29
2002	0.4981	0.0697	0.5611	0.0368	-0.0630	-1.79	0.12
2003	0.4721	0.0918	0.5324	0.0695	-0.0603	-0.91	0.42
2004	0.7325	0.3206	0.5133	0.0928	0.2193	0.93	0.52
2005	0.6219	0.1834	0.5349	0.0818	0.0870	1.06	0.32
2006	0.5055	0.0335	0.5080	0.0965	-0.0025	-0.05	0.96
2007	0.4960	0.0677	0.4280	0.2046	0.0680	0.45	0.73
2001-2007	0.5520	0.1363	0.5195	0.0867	0.0325	1.03	0.31

Table 5.12 Pre-merger Cost and Profit Efficiency of WEE Bidders and CEE Targets

Year	WEE Bidders		CEE Targets		Difference		
	Mean	Std dev	Mean	Std dev	Mean	t-stat	p-value
Panel A: Summary Statistics for Cost Efficiency							
2001	0.6615	0.0097	0.7528	0.0315	-0.0913	-3.26	0.19
2002	0.7495	0.1440	0.6830	0.0357	0.0665	0.63	0.64
2003	0.6657	0.0142	0.7026	0.0541	-0.0370	-1.14	0.37
2004	0.6656	0.1723	0.7399	0.0757	-0.743	-1.58	0.46
2005	0.7157	0.0862	0.6921	0.0139	0.0236	0.46	0.68
2006	0.7735	0.1353	0.7094	0.0230	0.640	1.04	0.36
2007	0.7130	0.0324	0.8465	0.2087	-0.1335	-1.05	0.49
2001-2007	0.7219	0.0968	0.7274	0.0836	-0.0054	-0.17	0.86
Panel B: Summary Statistics for Profit Efficiency							
2001	0.5909	0.1084	0.5306	0.0195	0.0604	0.39	0.77
2002	0.4984	0.0860	0.5379	0.0286	-0.0395	-0.62	0.65
2003	0.5178	0.0862	0.4763	0.0588	0.0415	0.69	0.53
2004	0.5058	0.0605	0.4476	0.0702	0.0582	0.78	0.52
2005	0.6899	0.2624	0.5596	0.0168	0.1303	0.86	0.48
2006	0.5496	0.0339	0.5551	0.0311	-0.0055	-0.27	0.79
2007	0.4151	0.1006	0.5821	0.0503	-0.1671	-0.76	0.59
2001-2007	0.5550	0.1299	0.5323	0.0491	0.0225	0.65	0.52

5.6 Appendix 5.2: Pre-merger and Post-merger Cost and Profit Efficiency

Table 5.13 Pre-merger and Post-merger Cost and Profit Efficiency of Mergers and Peers (2001)
Mergers occurred in 2001 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	All Mergers	Peers	All Mergers	Peers
1 Year post-merger	0.6942	0.7747	0.5223	0.7321
Pre-merger	0.7341	0.7329	0.5671	0.6463
Change	-0.0399	0.0418	-0.0449	0.0858
z-statistic	-1.57	-0.94	-2.20	-1.36
p-value	0.12	0.35	0.03*	0.17
2 Years post-merger	0.7055	0.7070	0.5476	0.6932
Pre-merger	0.7341	0.7329	0.5671	0.6463
Change	-0.0286	-0.0259	-0.0196	0.0469
z-statistic	-.1.15	-1.57	-0.94	-0.73
p-value	0.25	0.12	0.35	0.46
3 Years post-merger	0.6551	0.7380	0.5398	0.6437
Pre-merger	0.7341	0.7329	0.5671	0.6463
Change	-0.0790	0.0534	-0.0274	-0.0026
z-statistic	-1.99	-0.73	-0.11	-0.11
p-value	0.05*	0.46	0.92	0.92

Note: *Significant at the 5% level.

Table 5.14 Pre-merger and Post-merger Cost and Profit Efficiency of Mergers and Peers (2002)
Mergers occurred in 2002 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	All Mergers	Peers	All Mergers	Peers
1 Year post-merger	0.7013	0.8072	0.6015	0.6611
Pre-merger	0.7101	0.7342	0.5145	0.7315
Change	-0.0088	0.0730	0.0870	-0.0705
z-statistic	-0.11	-0.73	0.73	-0.52
p-value	0.92	0.46	0.46	0.60
2 Years post-merger	0.7087	0.7187	0.5289	0.7078
Pre-merger	0.7101	0.7342	0.5145	0.7315
Change	-0.0015	-0.0155	0.0144	-0.0237
z-statistic	-0.11	-0.73	-0.31	-0.11
p-value	0.92	0.46	0.75	0.92
3 Years post-merger	0.6859	0.7346	0.5468	0.6853
Pre-merger	0.7101	0.7342	0.5145	0.7315
Change	-0.0242	0.0004	0.0323	-0.0463
z-statistic	-1.36	-0.11	-1.78	-0.31
p-value	0.17	0.92	0.08**	0.75

Note: **Significant at the 10% level.

Table 5.15 Pre-merger and Post-merger Cost and Profit Efficiency of Mergers and Peers (2003)
Mergers occurred in 2003 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	All Mergers	Peers	All Mergers	Peers
1 Year post-merger	0.6600	0.7370	0.5534	0.7265
Pre-merger	0.6656	0.7252	0.5092	0.6599
Change	-0.0056	0.0118	0.0442	0.0666
z-statistic	-0.52	-0.52	-1.99	-0.94
p-value	0.60	0.60	0.05*	0.35
2 Years post-merger	0.6700	0.7111	0.5700	0.6984
Pre-merger	0.6656	0.7252	0.5092	0.6599
Change	0.0044	-0.0141	0.0609	0.0386
z-statistic	0.31	-1.36	-1.78	-0.94
p-value	0.75	0.17	0.08**	0.35
3 Years post-merger	0.6721	0.7433	0.5454	0.7103
Pre-merger	0.6656	0.7252	0.5092	0.6599
Change	0.0065	0.0181	0.0363	0.0504
z-statistic	-0.52	-0.73	-1.12	-0.94
p-value	0.60	0.46	0.25	0.35

Note: *Significant at the 5% level; **Significant at the 10% level.

Table 5.16 Pre-merger and Post-merger Cost and Profit Efficiency of Cross-border and Domestic Mergers (2001)
Mergers occurred in 2001 and post-merger efficiency of the combined firm is estimated for the following three years**.**

Period	Cost Efficiency		Profit Efficiency	
	Cross-border	Domestic	Cross-border	Domestic
1 Year post-merger	0.6766	0.7030	0.5365	0.5151
Pre-merger	0.7178	0.7423	0.5784	0.5615
Change	-0.0411	-0.0392	-0.0419	-0.0464
z-statistic	-0.45	-1.46	-1.34	-1.83
p-value	0.66	0.14	0.18	0.07**
2 Years post-merger	0.6754	0.7205	0.5303	0.5562
Pre-merger	0.7178	0.7423	0.5784	0.5615
Change	-0.0424	-0.0217	-0.0481	-0.0053
z-statistic	-0.45	-1.46	-1.34	0.00
p-value	0.66	0.14	0.18	1.00
3 Years post-merger	0.6433	0.6609	0.5927	0.4846
Pre-merger	0.7178	0.7423	0.5784	0.5615
Change	-0.0745	-0.0813	0.0143	-0.0769
z-statistic	-1.34	-1.46	-1.34	-1.46
p-value	0.18	0.14	0.18	0.14

Note: **Significant at the 10% level.

Table 5.17 Pre-merger and Post-merger Cost and Profit Efficiency of Cross-border and Domestic Mergers (2002)
Mergers occurred in 2002 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Cross-border	Domestic	Cross-border	Domestic
1 Year post-merger	0.7392	0.6823	0.5476	0.5238
Pre-merger	0.7483	0.6910	0.4985	0.5225
Change	-0.0091	-0.0087	0.0490	0.0014
z-statistic	-1.34	-0.37	-0.45	-0.37
p-value	0.18	0.72	0.66	0.72
2 Years post-merger	0.7920	0.6670	0.4822	0.5523
Pre-merger	0.7483	0.6910	0.4985	0.5225
Change	0.0437	-0.0241	-0.0163	0.0298
z-statistic	-0.45	-0.73	0.45	-0.73
p-value	0.66	0.47	0.66	0.47
3 Years post-merger	0.7637	0.6470	0.5021	0.5692
Pre-merger	0.7483	0.6910	0.4985	0.5225
Change	0.0154	-0.0440	0.0035	0.0467
z-statistic	-0.45	-1.83	0.45	-1.83
p-value	0.66	0.07**	0.66	0.07**

Note: **Significant at the 10% level.

Table 5.18 Pre-merger and Post-merger Cost and Profit Efficiency of Cross-border and Domestic Mergers (2003)
Mergers occurred in 2003 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Cross-border	Domestic	Cross-border	Domestic
1 Year post-merger	0.6603	0.6663	0.5598	0.5529
Pre-merger	0.6661	0.6683	0.5264	0.4849
Change	-0.0058	-0.0020	0.0334	0.0680
z-statistic	-0.41	-0.45	-1.75	-1.34
p-value	0.69	0.66	0.08**	0.18
2 Years post-merger	0.6709	0.6556	0.5726	0.5805
Pre-merger	0.6661	0.6683	0.5264	0.4849
Change	0.0049	-0.0127	0.0463	0.0956
z-statistic	-0.41	-0.45	-1.48	-1.34
p-value	0.69	0.66	0.14	0.18
3 Years post-merger	0.6761	0.6575	0.5421	0.5617
Pre-merger	0.6661	0.6683	0.5264	0.4849
Change	0.0100	-0.0107	0.0157	0.0768
z-statistic	-0.14	-1.34	-0.67	-1.34
p-value	0.89	0.18	0.50	0.18

Note: **Significant at the 10% level.

Table 5.19 Pre-merger and Post-merger Cost and Profit Efficiency of Large Firms and Peers (2001)
Mergers occurred in 2001 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Large Firms	Peers	Large Firms	Peers
1 Year post-merger	0.6901	0.7780	0.5468	0.6712
Pre-merger	0.7375	0.7588	0.5852	0.5683
Change	-0.0474	0.0192	-0.0384	-0.1029
z-statistic	-1.07	-0.54	-1.60	-1.07
p-value	0.29	0.59	0.11	0.29
2 Years post-merger	0.6990	0.6971	0.5538	0.6846
Pre-merger	0.7375	0.7588	0.5852	0.5683
Change	-0.0385	-0.0618	-0.0313	0.1163
z-statistic	-0.54	-1.60	-1.07	-1.07
p-value	0.59	0.11	0.29	0.29
3 Years post-merger	0.6485	0.7499	0.5526	0.6161
Pre-merger	0.7375	0.7588	0.5852	0.5683
Change	-0.0890	-0.0089	-0.0326	-0.0478
z-statistic	-1.60	0.00	0.00	-0.54
p-value	0.11	1.00	1.00	0.59

Table 5.20 Pre-merger and Post-merger Cost and Profit Efficiency of Large Firms and Peers (2002)
Mergers occurred in 2002 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Large Firms	Peers	Large Firms	Peers
1 Year post-merger	0.6988	0.7148	0.5296	0.7219
Pre-merger	0.6616	0.7108	0.5563	0.6496
Change	0.0372	0.0040	-0.0267	0.0722
z-statistic	-1.34	-0.45	-0.45	1.34
p-value	0.18	0.66	0.66	0.18
2 Years post-merger	0.6620	0.6874	0.5393	0.7356
Pre-merger	0.6616	0.7108	0.5563	0.6496
Change	0.0004	-0.0234	-0.0170	0.0860
z-statistic	-0.45	-1.34	-0.45	-1.34
p-value	0.66	0.18	0.66	0.18
3 Years post-merger	0.6454	0.7079	0.5773	0.7381
Pre-merger	0.6616	0.7108	0.5563	0.6496
Change	-0.0162	-0.0029	0.0210	0.0885
z-statistic	-1.34	-1.34	-1.34	-1.34
p-value	0.18	0.18	0.18	0.18

Table 5.21 Pre-merger and Post-merger Cost and Profit Efficiency of Large Firms and Peers (2003)
Mergers occurred in 2003 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Large Firms	Peers	Large Firms	Peers
1 Year post-merger	0.6514	0.7679	0.5615	0.6739
Pre-merger	0.6710	0.7211	0.5402	0.6729
Change	-0.0196	0.0467	0.0212	0.0010
z-statistic	-1.07	-1.60	-1.07	0.00
p-value	0.29	0.11	0.29	1.00
2 Years post-merger	0.6551	0.8042	0.5767	0.6049
Pre-merger	0.6710	0.7211	0.5402	0.6729
Change	-0.0159	0.0831	0.0364	-0.0680
z-statistic	-1.60	-0.54	-1.60	-1.07
p-value	0.11	0.59	0.11	0.29
3 Years post-merger	0.6608	0.7285	0.5270	0.6596
Pre-merger	0.6710	0.7211	0.5402	0.6729
Change	-0.0102	0.0074	-0.0132	-0.0133
z-statistic	-0.54	0.00	0.00	0.00
p-value	0.59	1.00	1.00	1.00

Table 5.22 Pre-merger and Post-merger Cost and Profit Efficiency of Small Firms and Peers (2001)
Mergers occurred in 2001 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Small Firms	Peers	Small Firms	Peers
1 Year post-merger	0.6983	0.7585	0.4978	0.7990
Pre-merger	0.7123	0.7070	0.5491	0.7242
Change	-0.0140	0.0614	-0.0514	0.0748
z-statistic	0.00	-1.60	-1.60	-0.54
p-value	1.00	0.11	0.11	0.59
2 Years post-merger	0.7120	0.7256	0.5413	0.6720
Pre-merger	0.7123	0.7070	0.5491	0.7242
Change	-0.0003	0.0186	-0.0078	-0.0522
z-statistic	0.00	-0.54	-0.54	-0.54
p-value	1.00	0.59	0.59	0.59
3 Years post-merger	0.6616	0.7049	0.5270	0.6386
Pre-merger	0.7123	0.7070	0.5491	0.7242
Change	-0.0507	-0.0022	-0.0221	-0.0856
z-statistic	-1.07	0.00	0.00	-1.07
p-value	0.29	1.00	1.00	0.29

Table 5.23 Pre-merger and Post-merger Cost and Profit Efficiency of Small Firms and Peers (2002)
Mergers occurred in 2002 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Small Firms	Peers	Small Firms	Peers
1 Year post-merger	.7086	0.8316	0.4246	0.6492
Pre-merger	.7210	0.7392	0.5047	0.7397
Change	-0.0124	0.0923	-0.0080	-0.0904
z-statistic	-0.67	-1.21	-0.67	-0.67
p-value	0.50	0.23	0.50	0.50
2 Years post-merger	0.7156	0.7309	0.5178	0.6512
Pre-merger	0.7210	0.7392	0.5047	0.7397
Change	-0.0054	-0.0083	0.0131	-0.0884
z-statistic	-0.14	-0.41	-0.14	-0.67
p-value	0.89	0.69	0.89	0.50
3 Years post-merger	0.6940	0.7398	0.5354	0.6878
Pre-merger	0.7210	0.7392	0.5047	0.7397
Change	-0.0270	0.0005	0.0307	-0.0519
z-statistic	-1.21	-0.41	-1.48	0.67
p-value	0.23	0.69	0.14	0.50

Table 5.24 Pre-merger and Post-merger Cost and Profit Efficiency of Small Firms and Peers (2003)
Mergers occurred in 2003 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	Small Firms	Peers	Small Firms	Peers
1 Year post-merger	0.6686	0.7195	0.5453	0.7839
Pre-merger	0.6602	0.7293	0.4781	0.6468
Change	0.0084	-0.0098	0.0672	0.1370
z-statistic	0.00	-0.54	-1.60	0.54
p-value	1.00	0.59	0.11	0.59
2 Years post-merger	0.6850	0.7423	0.5634	0.7715
Pre-merger	0.6602	0.7293	0.4781	0.6468
Change	0.0248	0.0131	0.0853	0.1246
z-statistic	-1.60	0.00	-1.07	0.54
p-value	0.11	1.00	0.29	0.59
3 Years post-merger	0.6835	0.7621	0.5639	0.7676
Pre-merger	0.6602	0.7293	0.4781	0.6468
Change	0.0233	0.0329	0.0858	0.1207
z-statistic	0.00	-1.07	-1.07	0.54
p-value	1.00	0.29	0.29	0.59

Table 5.25 Pre-merger and Post-merger Cost and Profit Efficiency of WEE Merged Firms and Peers (2001)
Mergers occurred in 2001 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	WEE Merged Firms	Peers	WEE Merged Firms	Peers
1 Year post-merger	0.6791	0.7597	0.5657	0.7393
Pre-merger	0.6625	0.7191	0.5903	0.7280
Change	0.0166	0.0406	-0.0246	0.0113
z-statistic	-0.45	-1.34	-0.45	-1.34
p-value	0.66	0.18	0.66	0.18
2 Years post-merger	0.7002	0.7490	0.5836	0.7007
Pre-merger	0.6625	0.7191	0.5903	0.7280
Change	0.0377	0.0299	-0.0066	-0.0273
z-statistic	-1.34	-0.45	-0.45	-0.45
p-value	0.18	0.66	0.66	0.66
3 Years post-merger	0.6472	0.7049	0.6057	0.7508
Pre-merger	0.6625	0.7191	0.5903	0.7280
Change	-0.0153	-0.0142	0.0155	0.0228
z-statistic	0.45	-1.34	-1.34	-1.34
p-value	0.66	0.18	0.18	0.18

Table 5.26 Pre-merger and Post-merger Cost and Profit Efficiency of WEE Merged Firms and Peers (2002)
Mergers occurred in 2002 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	WEE Merged Firms	Peers	WEE Merged Firms	Peers
1 Year post-merger	0.7392	0.7552	0.7568	0.8364
Pre-merger	0.7483	0.7359	0.4985	0.8399
Change	-0.0091	0.0193	0.2583	-0.0034
z-statistic	-1.34	-1.34	-1.34	-0.45
p-value	0.18	0.18	0.18	0.66
2 Years post-merger	0.7920	0.7562	0.4822	0.8567
Pre-merger	0.7483	0.7359	0.4985	0.8399
Change	0.0437	0.0204	-0.0163	0.0168
z-statistic	-0.45	-0.45	-0.45	-0.45
p-value	0.66	0.66	0.66	0.66
3 Years post-merger	0.7637	0.7076	0.5021	0.8107
Pre-merger	0.7483	0.7359	0.4985	0.8399
Change	0.0154	-0.0283	-0.0035	-0.0291
z-statistic	-0.45	-1.34	-0.45	-0.45
p-value	0.66	0.18	0.66	0.66

Table 5.27 Pre-merger and Post-merger Cost and Profit Efficiency of WEE Merged Firms and Peers (2003)
Mergers occurred in 2003 and post-merger efficiency of the combined firm is estimated for the following three years.

Period	Cost Efficiency		Profit Efficiency	
	WEE Merged Firms	Peers	WEE Merged Firms	Peers
1 Year post-merger	0.6628	0.7434	0.5687	0.7634
Pre-merger	0.6661	0.7230	0.5218	0.7921
Change	-0.0033	0.0204	0.0469	-0.0287
z-statistic	-0.54	-1.07	-1.60	-0.54
p-value	0.59	0.29	0.11	0.59
2 Years post-merger	0.6855	0.7190	0.5629	0.8086
Pre-merger	0.6661	0.7230	0.5218	0.7921
Change	0.0194	-0.0040	0.0411	0.0165
z-statistic	-0.54	0.00	-0.54	0.00
p-value	0.59	1.00	0.59	1.00
3 Years post-merger	0.6818	0.7409	0.5283	0.8411
Pre-merger	0.6661	0.7230	0.5218	0.7921
Change	0.0157	0.0178	0.0065	0.0490
z-statistic	0.00	0.54	0.00	-0.54
p-value	1.00	0.59	1.00	0.59

5.7 Appendix 5.3: Results of the Translog Function Estimates

Table 5.28Maximum Likelihood Estimates of the Cost and Profit Functions for Bidding Banks

		Cost Function			Profit Function		
Parameter	Variable	Coefficient	Standard Error	t-ratio	Coefficient	Standard Error	t-ratio
β_0	Constant	4.028	3.237	1.244	72.604	3.374	21.513*
β_1	ln(Q1)	-0.511	0.586	-0.871	-0.173	-0.797	-0.217
β_2	ln(Q2)	-1.356	0.578	-2.347*	-1.107	0.856	-1.293
β_3	ln(Q3)	0.161	0.199	0.807	-0.007	0.506	-1.349
β_4	ln(W1/W3)	0.982	0.584	1.681	5.060	0.983	5.144*
β_5	ln(W2/W3)	1.922	0.311	6.176*	-1.315	0.561	-2.343*
β_6	½(ln(Q1))^2	0.040	0.021	1.966**	-0.066	0.042	-1.558
β_7	ln(Q1)ln(Q2)	-1.104	0.038	-2.758*	-0.042	-0.079	-0.534
β_8	ln(Q1)ln(Q3)	-0.000	0.016	-0.012	0.056	0.036	1.549
β_9	½(ln(Q2))^2	0.088	0.062	1.413	0.132	0.139	0.945
β_{10}	ln(Q2)ln(Q3)	-0.009	0.016	-0.619	0.012	0.037	0.284
β_{11}	½(ln(Q3))^2	0.041	0.006	6.072*	-0.058	0.026	-2.268*
β_{12}	½(ln(W1/W3))^2	-0.037	0.037	-0.976	-0.073	0.078	-0.933
β_{13}	ln(Q1)ln(W1/W3)	-0.032	0.034	-0.949	-0.148	0.066	-2.228*
β_{14}	ln(Q2)ln(W1/W3)	0.093	0.051	1.809**	-0.118	0.112	-1.049
β_{15}	ln(Q3)ln(W1/W3)	-0.003	0.022	-0.149	-0.029	0.052	-0.578
β_{16}	½(ln(W2/W3))^2	-0.049	0.012	-3.897*	-0.016	0.029	-0.548
β_{17}	ln(Q1)ln(W2/W3)	-0.039	-0.024	-1.661	0.090	0.046	1.942**
β_{18}	ln(Q2)ln(W2/W3)	0.137	0.027	5.110*	-0.035	0.066	-0.531
β_{19}	ln(Q3)ln(W2/W3)	-0.038	0.011	-3.295*	0.036	0.029	1.217
β_{20}	ln(W1/W3)ln(W2/W3)	-0.055	0.014	-3.882*	0.094	0.037	2.494*
β_{21}	ln(E)	2.237	0.627	3.568*	-2.265	0.869	-2.604*
β_{22}	½(ln(E))^2	-0.238	0.074	-3.175*	0.086	0.174	-0.498
β_{23}	ln(E)ln(Q1)	0.124	0.050	2.475*	0.054	0.101	0.536
β_{24}	ln(E)ln(Q2)	0.072	0.061	1.177	-0.051	0.145	-0.349
β_{25}	ln(E)ln(Q3)	-0.033	0.018	-1.880**	0.021	0.060	0.349
β_{26}	ln(E)ln(W1/W3)	-0.98	0.057	-1.723**	0.109	0.099	1.093
β_{27}	ln(E)ln(W2/W3)	-0.133	0.030	-4.356*	-0.043	0.060	-0.713
β_{28}	T	0.168	0.124	1.353	0.028	0.296	0.094

β_{29}	T^2	-0.005	0.003	-2.078**	-0.020	0.007	-2.794*
β_{30}	ln(Q1)T	0.007	0.009	0.797	-0.009	0.019	-0.463
β_{31}	ln(Q2)T	-0.009	0.012	-0.798	0.042	0.031	1.357
β_{32}	ln(Q3)T	0.008	0.006	1.503	-0.047	0.017	-2.708*
β_{33}	ln(W1/W3)T	0.036	0.009	4.080*	0.014	0.023	0.603
β_{34}	ln(W2/W3)T	-0.015	0.005	-3.166*	0.009	0.012	0.776
β_{35}	ln(E)T	-0.012	0.013	-0.896	0.020	0.034	0.592
δ_0	Constant	2.401	0.212	11.343*	-9.998	2.206	-4.532*
δ_1	EQTA	3.563	1.062	3.352*	-4.914	2.595	-1.894**
δ_2	LONDEP	-2.146	0.168	-12.732*	4.714	0.714	6.595*
δ_3	CONCT	-1.585	0.307	-5.168*	2.942	0.916	3.210
δ_4	INFL	0.313	0.041	7.600*	-2.021	0.114	-17.764*
δ_5	GDPRT	0.104	0.032	3.208*	-1.278	0.215	-5.948*
δ_6	MACGDP	-0.016	0.001	-12.661*	-0.064	-0.006	-11.031*
δ_7	CLAIMS	0.006	0.002	3.796*	0.024	0.008	2.919*
δ_8	CAPRQ	-0.249	0.038	-6.592*	0.267	0.167	1.600
σ^2		0.197	0.025	7.762*	5.844	0.516	11.326*
γ		0.991	0.003	361.060*	0.996	0.001	987.485*
Log likelihood function			258.817			-141.417	

*Significant at the 5% level; ** Significant at the 10% level.

Table 5.29 Maximum Likelihood Estimates of the Cost and Profit Functions for Target Banks

		Cost Function			Profit Function		
Parameter	Variable	Coefficient	Standard Error	t-ratio	Coefficient	Standard Error	t-ratio
β_0	Constant	3.743	1.363	2.745*	31.425	1.256	25.014*
β_1	ln(Q1)	0.222	0.369	0.602	1.911	0.422	4.529*
β_2	ln(Q2)	0.741	0.351	2.111*	-0.012	0.479	-0.024
β_3	ln(Q3)	0.570	0.171	3.336*	-0.423	0.230	-1.836**
β_4	ln(W1/W3)	-0.588	0.324	-1.816**	-0.049	0.457	-0.109
β_5	ln(W2/W3)	-0.154	0.235	-0.653	1.904	0.271	7.028*
β_6	½(ln(Q1))^2	0.169	0.034	5.013*	-0.042	0.045	-0.934
β_7	ln(Q1)ln(Q2)	-0.124	0.030	-4.099*	0.000	0.029	0.016
β_8	ln(Q1)ln(Q3)	-0.035	0.025	-1.389	0.013	0.026	0.480
β_9	½(ln(Q2))^2	0.122	0.029	4.065*	0.044	0.042	1.035
β_{10}	ln(Q2)ln(Q3)	0.098	0.019	4.987*	-0.054	0.025	-2.199*
β_{11}	½(ln(Q3))^2	-0.018	0.017	-1.044	-0.015	0.019	-0.818
β_{12}	½(ln(W1/W3))^2	-0.033	0.044	-0.741	0.412	0.056	7.388*

β_{13}	ln(Q1)ln(W1/W3)	-0.019	0.034	-0.566	0.029	0.035	0.837
β_{14}	ln(Q2)ln(W1/W3)	-0.012	0.031	-0.378	0.083	0.038	-2.166*
β_{15}	ln(Q3)ln(W1/W3)	0.028	0.022	1.256	0.009	0.024	0.389
β_{16}	½(ln(W2/W3))^2	-0.011	0.018	-0.610	-0.022	0.017	-1.256
β_{17}	ln(Q1)ln(W2/W3)	0.074	0.021	3.522*	-0.088	0.025	-3.591*
β_{18}	ln(Q2)ln(W2/W3)	0.005	0.025	0.220	-0.035	0.032	-1.087
β_{19}	ln(Q3)ln(W2/W3)	-0.072	0.018	-4.081*	0.034	0.020	1.708
β_{20}	ln(W1/W3)ln(W2/W3)	-0.006	0.019	-0.324	-0.008	0.018	-0.426
β_{21}	ln(E)	-0.733	0.569	-1.289	-2.709	0.705	-3.842*
β_{22}	½(ln(E))^2	0.246	0.096	2.556*	0.043	0.114	0.372
β_{23}	ln(E)ln(Q1)	-0.012	0.044	-0.276	-0.038	0.048	-0.773
β_{24}	ln(E)ln(Q2)	-0.122	0.054	-2.266*	0.032	0.062	0.512
β_{25}	ln(E)ln(Q3)	-0.062	0.031	-2.010**	0.075	0.032	2.346*
β_{26}	ln(E)ln(W1/W3)	0.045	0.051	0.885	0.044	0.059	0.732
β_{27}	ln(E)ln(W2/W3)	0.003	0.038	0.073	0.012	0.049	0.251
β_{28}	T	0.378	0.122	3.111*	-0.073	0.154	-0.471
β_{29}	T^2	-0.017	0.006	-2.924*	0.003	0.006	0.457
β_{30}	ln(Q1)T	-0.038	0.014	-2.764*	-0.022	0.017	-1.308
β_{31}	ln(Q2)T	0.023	0.013	1.808**	-0.010	0.014	-0.725
β_{32}	ln(Q3)T	-0.002	0.009	-0.213	-0.029	0.012	-2.566*
β_{33}	ln(W1/W3)T	-0.003	0.014	-0.189	0.048	0.017	2.743*
β_{34}	ln(W2/W3)T	-0.022	0.010	-2.176*	0.017	0.011	0.162
β_{35}	ln(E)T	0.013	0.021	0.615	0.069	0.024	2.893*
δ_0	Constant	-0.010	0.692	-1.516	-0.002	2.836	-8.515*
δ_1	EQTA	-7.897	1.984	-3.979*	-0.001	1.225	-10.571*
δ_2	LONDEP	0.164	-0.099	1.643	0.467	0.066	7.080*
δ_3	CONCT	-4.161	0.641	-6.493*	5.617	1.533	3.664*
δ_4	INFL	0.051	0.013	3.983*	0.191	0.025	7.761*
δ_5	GDPRT	0.564	0.054	10.367*	-0.432	0.139	-3.117*
δ_6	MACGDP	-0.020	0.005	-4.422*	-0.037	0.003	-10.801*
δ_7	CLAIMS	0.027	0.004	6.199*	0.015	0.007	2.206*
δ_8	CAPRQ	-0.273	0.043	-6.356*	-0.244	0.141	-1.727**
σ^2		0.806	0.137	5.906*	0.001	0.662	17.259*
γ		0.965	0.008	111.394*	0.998	0.001	1922.068*
Log likelihood function			-42.533			-177.879	

*Significant at the 5% level; ** Significant at the 10% level.

Table 5.30 Maximum Likelihood Estimates of the Cost and Profit Functions for Peer Banks

		Cost Function			Profit Function		
Parameter	Variable	Coefficient	Standard Error	t-ratio	Coefficient	Standard Error	t-ratio
β_0	Constant	2.490	0.538	4.625*	39.454	1.513	26.062*
β_1	ln(Q1)	0.532	0.057	9.336*	0.587	0.183	3.196*
β_2	ln(Q2)	0.732	0.057	12.677*	0.767	0.174	4.407*
β_3	ln(Q3)	-0.082	0.040	-2.042**	-0.403	0.129	-3.115*
β_4	ln(W1/W3)	0.045	0.064	0.702	0.170	0.224	0.758
β_5	ln(W2/W3)	-0.091	0.036	-2.475*	0.204	0.119	1.710
β_6	½(ln(Q1))^2	0.131	0.003	39.396*	0.116	0.015	7.901*
β_7	ln(Q1)ln(Q2)	-0.154	0.004	-36.1358*	-0.054	0.014	-3.836*
β_8	ln(Q1)ln(Q3)	-0.008	0.002	-4.019*	-0.022	0.007	-3.138*
β_9	½(ln(Q2))^2	0.082	0.003	25.054*	0.071	0.011	6.676*
β_{10}	ln(Q2)ln(Q3)	0.006	0.002	2.483*	0.005	0.007	0.729
β_{11}	½(ln(Q3))^2	-0.001	0.002	-0.371	-0.046	0.007	-6.518*
β_{12}	½(ln(W1/W3))^2	-0.002	0.006	-0.311	-0.043	0.018	-2.367*
β_{13}	ln(Q1)ln(W1/W3)	0.011	0.004	2.950*	0.028	0.013	2.150*
β_{14}	ln(Q2)ln(W1/W3)	0.014	0.005	2.898*	-0.007	0.013	-0.514
β_{15}	ln(Q3)ln(W1/W3)	-0.004	0.003	-1.114	0.018	0.012	1.464
β_{16}	½(ln(W2/W3))^2	0.021	0.002	7.411*	-0.018	0.009	-1.897**
β_{17}	ln(Q1)ln(W2/W3)	0.002	0.003	1.038	0.023	0.008	2.714*
β_{18}	ln(Q2)ln(W2/W3)	0.004	0.003	1.376	0.003	0.007	0.435
β_{19}	ln(Q3)ln(W2/W3)	0.001	0.002	0.796	-0.021	0.007	-2.930*
β_{20}	ln(W1/W3)ln(W2/W3)	-0.019	0.003	-6.004*	0.013	0.009	1.367
β_{21}	ln(E)	-0.314	0.107	-2.925*	-0.026	0.318	-8.466*
β_{22}	½(ln(E))^2	-0.074	0.013	-5.921*	0.183	0.039	4.632*
β_{23}	ln(E)ln(Q1)	0.029	0.006	4.943*	-0.076	0.021	-3.512*
β_{24}	ln(E)ln(Q2)	0.053	0.007	7.762*	-0.053	0.022	-2.460*
β_{25}	ln(E)ln(Q3)	0.008	0.004	2.126*	0.087	0.013	6.681*
β_{26}	ln(E)ln(W1/W3)	-0.017	0.008	-2.180*	-0.027	0.025	-1.078
β_{27}	ln(E)ln(W2/W3)	-0.005	0.005	-1.019	-0.001	0.015	-0.093
β_{28}	T	0.066	0.032	2.050**	0.150	0.100	1.501
β_{29}	T^2	-0.004	0.002	-2.853*	-0.006	0.005	-1.196
β_{30}	ln(Q1)T	0.007	0.002	3.624*	-0.005	0.006	-0.799
β_{31}	ln(Q2)T	-0.003	0.002	-1.438	0.006	0.007	0.942
β_{32}	ln(Q3)T	-0.005	0.002	-2.811*	-0.001	0.005	-1.824**

β_{33}	ln(W1/W3)T	0.000	0.003	0.035	0.011	0.008	1.285
β_{34}	ln(W2/W3)T	-0.006	0.002	-3.324*	-0.014	0.005	-2.663*
β_{35}	ln(E)T	-0.000	0.004	-2.925*	0.009	0.011	0.829
δ_0	Constant	-3.314	0.283	-11.685*	-0.002	2.758	-8.529*
δ_1	EQTA	9.533	0.301	31.067*	-0.442	1.046	-0.423
δ_2	LONDEP	0.000	0.000	3.107*	0.000	0.000	0.255
δ_3	CONCT	-5.065	0.250	-20.214*	18.309	1.998	9.163*
δ_4	INFL	0.067	0.003	20.671*	-0.091	0.015	-5.686*
δ_5	GDPRT	-0.023	0.016	-1.439	1.230	0.123	9.987*
δ_6	MACGDP	-0.027	0.001	-32.703*	-0.067	0.008	-8.036*
δ_7	CLAIMS	-0.036	0.002	-22.515*	0.044	0.005	8.034*
δ_8	CAPRQ	-0.106	0.014	-7.467*	0.456	0.054	8.310*
σ^2		4.261	0.129	32.781*	18.226	1.851	9.846*
γ		0.986	0.001	1454.940*	0.980	0.002	494.507*
Log likelihood function			-3210.661			-11458.499	

*Significant at the 5% level; ** Significant at the 10% level.

6

Market Pricing of Bank Merger Efficiency

"Under the semi-strong efficient market hypothesis, stock prices react positively (negatively) to public events and announcements that informed market participants expect will increase (decrease) long-run firm value. However, realized long-run outcomes need not be consistent with short-run market reactions". - Gayle Delong and Robert DeYoung (2007).

6.0 Introduction

The purpose of this chapter is to determine whether efficiency information is assimilated into a bank's share price on merger announcement. According to the semi-strong form of the Efficient Market Hypothesis (EMH), in a perfect market all information available to the public is already absorbed in a stock's price, and any new information gets instantaneously absorbed as it is made available. The strong form of the EMH goes further than that to argue that even private information usually available to only insiders is taken into account by the market in setting prices. Since the semi-strong form of efficiency is generally more acceptable on the basis of empirical evidence, this study proceeds on the assumption of its claims. At the same time, in some finance literature the share price is said to reflect the net present value of net future dividend cash flows of the firm. This alludes to a market's awareness of the firm's future earnings potential and therefore ability to pay dividends. With regard to mergers, Healy *et al*. (p.46, 1992) observe that a merger's announcement returns represent the investors' expectations of future benefits that may accrue from that merger. One of the ways in which a market may perceive a firm's performance potential is by evaluating its efficiency record. In addition, past performance is often taken to be a good indicator of a firm's future performance. It may be said that, typically, market participants carry out their activities with future expectations, and that is why risk-taking and speculation exist.

In Chapter 3, an analysis of the market's reaction to a bank merger announcement revealed that overall the event gave rise to a positive change in the share price of the bidding firms, although in some cases it was not significant. Change in price is depicted by cumulative abnormal returns as analyzed in that chapter. The rise in share price may have been as a result of any number of reasons. In this study, the interest is to examine whether the market takes account of bank efficiency in determining the price change in response to a merger announcement. Since theory suggests that the price reflects past, present, and what the market perceives as future information, in this chapter both pre-merger and post-merger efficiency are investigated to see whether they are priced by the markets. Both pre-merger and post-merger efficiencies were obtained in Chapter 5.

6.1 Background

6.1.1 Relevant European Studies

There are many studies that have investigated the performance of European banks engaged in mergers in the past fifteen years. The main reason often given for merger has been the need to improve efficiency. Investigating efficiency has therefore been the main focus of those studies (Amel *et al.*, 2004). There are also studies that have examined the market's reaction to merger announcements (Cybo-Ottone and Murgia, 2000; Beitel *et al*., 2004). However, to date there has been only one study that examines whether the market takes account of efficiency when reacting to merger announcements through re-evaluation of the bank's share price. The study came out only recently (Chronopoulos *et al*., 2010), after this research had started, and investigates mergers that took place in the period 1997-2003. In that study, 30 European bank mergers are combined with 70 American bank mergers to examine whether the market integrates post-merger bank efficiency in share prices. The European sub-sample includes only banks from countries in the EU-15 plus Norway and Switzerland.

Chronopoulos *et al*. (2010) find that, overall, European bank mergers earn significant cumulative abnormal returns while US mergers gain very low returns. European bidders earn positive returns, although not statistically different from zero. Their US counterparts, on the other hand,

record losses ranging from - 2.99% to – 3.98%. Meanwhile, unlike the bidders, both European and American targets earn significant cumulative abnormal returns for their shareholders. On average, US targets earn between 4.7% and 6.3% more than their European counterparts, although the difference between them is not statistically significant. The study also reports that the bidders experience improvement in post-merger profit efficiency, while cost efficiency declines.

On investigating the association between cumulative abnormal returns and post-merger efficiency, Chronopoulos *et al*. (2010) report that correlation results show that there is a positive relationship between profit efficiency and the bidder's cumulative abnormal returns which is statistically significant. As for cost efficiency, the findings show a negative correlation relationship with cumulative abnormal returns, although the results are not statistically significant. The study also runs univariate regressions which yield results largely supportive of the correlation findings. Based on these results, the authors conclude that financial markets can price post-merger performance in bank efficiency when the merger is announced. However, that pricing is likely to be related more to profit efficiency than to cost efficiency.

There are several differences between this study and that of Chronopoulos *et al*. (2010), including the different periods investigated and composition of sample. In this study, the sample comprises banks from 22 European countries, out of which ten are from the EU-15, and covers the period 2001-2007. Whereas this study uses the stochastic frontier approach (SFA) for estimating efficiency, the above study uses data envelopment analysis (DEA). Furthermore, although both studies use the event study methodology for calculating abnormal returns, this study employs the market model for estimating normal returns, while the above study uses a modified market adjusted model. And, while their study analyzes only post-merger efficiency, this study investigates both pre-merger and post-merger efficiencies.

6.1.2 Relevant US Studies

Two US studies using the current methods (SFA and DEA) of estimating efficiency have investigated the market's incorporation of bank efficiency in the stock price upon merger

announcement, namely, Kohers *et al*. (2000) and Aggarwal *et al*. (2006). This research borrows from both of these studies, and specifies its models using the same control variables of *relative size* of target to bidder, *cross*-border/domestic differentiation, likewise distinguishing between *cash* and stock payment for mergers, common to both studies. In addition, it includes *serial* for repeat acquirers and bank *concentration* in the target's market, as used by the Aggarwal *et al*. (2006) study. It also similarly examines bidder efficiency, target efficiency, peer efficiency less target efficiency, and peer efficiency less the average of bidder and target efficiency and so on, as done in the two studies. Variables used in this study are discussed further under the section on Data and Methodology. In both Kohers *et al*. (2000) and this study, both cost and profit efficiency are analyzed, but Aggarwal *et al*. (2006) examine only profit efficiency.

Kohers *et al*. (2000) investigates a sample of 94 mergers involving bank holding companies (BHCs). The study uses both SFA and DEA to estimate efficiency and, using the market model, determines the cumulative abnormal returns that accrue to the bidder's shareholders in the two-day window of announcement day and the next. In order to compare the efficiencies of the merged banks with those of its peers, the study engages as its peers all the BHCs which were not involved in mergers in the years analyzed. Upon estimation of efficiency, Kohers *et al*. (2000) find that, pre-merger, merged banks are more profit efficient but less cost efficient than their peers. The study tests the *relative efficiency hypothesis* that suggests that upon taking over a less efficient bank a bidder will make changes that can improve the efficiency of the target and therefore the combined firm upon merger. Also tested, is the *low efficiency hypothesis* which proposes that where the targets' pre-merger efficiencies are less than either the bidders' or those of their peers, target efficiency will improve post-merger. The results of the study support both hypotheses. Furthermore, the study finds evidence that the greatest wealth effects accrue to the bidder's shareholders when a bidder takes over a relatively less efficient bank, allowing the former to implement a broad range of changes that generate efficiency improvements in the combined BHC.

Kohers *et al*. (2000) also test whether efficiency has any influence on the market's valuation of bank mergers. This is done by regressing the bidders' cumulative abnormal returns on efficiency

and the three control variables stated above. In general, the study finds evidence that efficiency has an effect on how the market evaluates bank mergers. One indication of this is that the bidder banks' cumulative abnormal returns are negatively associated with targets' cost as well as profit efficiency. The higher these efficiencies are the less the improvements that can be expected after merger. A similar indication is the finding that bidders' cumulative abnormal returns are positively correlated with the difference in peer and target efficiency. This means that the larger the difference between the two, the greater the potential for efficiency improvement post-merger.

Other than that it examines European data, this study differs fundamentally from that of Kohers *et al*. (2000) in that it is focused on examining cumulative abnormal returns for the two-day period combining the day before and the announcement day like the Aggarwal *et al*. (2006) study, rather than the two-day combined returns of the announcement and the following day. In theory, it is expected that markets will react instantaneously and fully to merger and other news when released. Impact of merger news on stock prices therefore ought to be highest on announcement. Due to market imperfections, highest impact may be delayed, but in the absence of information to the contrary, this study assumes that on the average it is achieved on announcement day. This suggests that it does not matter what window is chosen for analysis as long it includes the announcement day. Chronopoulos *et al*. (2010), for example, choose CAR-2, +2. This is a five-day window which might have an advantage of larger values when CARs are positive and probably produce more desirable results. Since this area has not been extensively researched, no guidelines exist on a suitable window for analysis. Although this study uses $CAR_{-1, 0}$ in its main analysis following Aggarwal *et al*. (2006), it also examines $CAR_{0, +1}$ as used by Kohers *et al*. (2000) in order to compare results.

Aggarwal *et al*. (2006) analyze 271 large bank mergers that took place in the period 1986-2001 to find out whether there is an association between profit efficiency and cumulative abnormal returns. The study analyzes three profit efficiency variables, namely, the bidders' pre-merger efficiency, the bidders' post-merger efficiency less the pre-merger efficiency, and the bidders' pre-merger efficiency less the targets' pre-merger efficiency. In its regressions, the study includes as control variables, *deposits* (target's as a percentage of total assets), industry

concentration (HHI for target country), *relative size*, *instate*, *stock*, *serial*, *price premium (deal price less target's market value, divided by bidder's market value)*, and *RNeal* (for the US Interstate Bank and Branching Efficiency Act, 1994).

The Aggarwal *et al*. (2006) study finds that before merger the targets are more profit efficient than the bidders. However, in the three years before the merger, the bidders had gained 6.38 percentage points in profit efficiency, which is far above the targets' 1.36 percentage points. The authors suggest on the basis of this finding that there may have been a strategy by the bidders to improve performance in various ways in preparation for a pre-planned restructuring move. Post-merger efficiency was also found to have improved over the pre-merger performance. Regression results of cumulative abnormal returns on the various variables stated above show that the market expects that bidder shareholders of highly efficient banks will benefit from the merger. Market expectations are similar in those cases where there is considerable difference between the bidder's and the target's profit efficiency. In addition, the findings suggest also that the market will react positively for bidder shareholders on merger announcement when the combined bank is likely to improve its profit efficiency after merger. Lastly, the study finds that the market expects bidder banks with prior acquisition experience to generate greater gains for their shareholders.

In an earlier study, Rhodes (1998) uses primarily accounting ratios as well as cost efficiency to examine the effect of efficiency gains on the stock price of a firm in a case study of nine bank mergers. In five of these mergers, results show that cost efficiency and stock price movement at the time of merger announcement are positively associated. With the rather limited sample of only nine mergers, it may not be convincing to generalize from these results about the relationship between efficiency and the market's reaction to bank merger announcement.

6.2 Data and Methodology

The data for the analysis performed in this chapter are based on the results obtained in Chapter 3 and Chapter 5. Bidder cumulative abnormal returns (CARs) pertaining to the full sample of 56

mergers for the two-day event period, (-1, 0), are used in the analysis, following Aggarwal *et al*. (2006). For comparison purposes, analysis is also performed using CARs for the two-day event period, (0, +1), as employed by Kohers *et al*. (2000). The CARs are regressed on the pre-merger cost efficiency and profit efficiency results for the full sample, together with a number of control variables as discussed below. Additional regressions are performed using post-merger cost efficiency and profit efficiency results for a sub-sample of mergers that took place in the period 2001-2003. This sub-sample is chosen because it is the only sub-sample for which financial data are available for both the year prior to merger and all of the three years after merger, making it possible to estimate post-merger efficiency for each of the three post-merger years as presented in Chapter 5. Both cost and profit efficiency are also averaged over the three years and analyzed.

6.2.1. Regression Model

Since the purpose in this chapter is to find out whether the market takes into account bank efficiency upon merger announcement, cumulative abnormal returns are regressed on efficiency and a number of control variables cited in the literature as having an influence on the market's reaction to bank merger announcements and stock price performance in general. Regression analyses are performed using the following model:

$$CAR_i = \alpha + \beta_i EFF_i + \beta_2 RSIZE_i + \beta_3 CROSS_i + \beta_4 CASH_i + \beta_5 SERIAL_i + \beta_6 DIVPAY_i + \beta_7 CONC_i + \varepsilon_i$$

where: CAR_i is the two-day cumulative abnormal return; EFF_i is bank efficiency or bank efficiency difference as discussed below; $RSIZE_i$ is the relative size of target to bidder bank measured in total assets; $CROSS_i$ is 1 when cross-border merger and 0 when domestic; $CASH_i$ is 1 when deal is paid for in cash and 0 when payment is in stock or mixture of cash and stock; $SERIAL_i$ is 1 for a bank that has recently been involved in other acquisitions and 0 otherwise; $DIVPAY_i$ is dividend payout; $CONC_i$ is bank concentration in the target's country; i stands for bank. The model comprises the efficiency variable, and there are five of them considered in both cost efficiency and profit efficiency analyses, and six control variables.

6.2.2 Efficiency Variables

Five efficiency variables are considered separately in the above model, and for each, cost efficiency and profit efficiency are analyzed. The efficiency variables are:

Pre-merger bidder efficiency

The market expects that a bank seeking to merge with another will be one with a good record of performance and therefore high efficiency. This efficiency should influence the market to react to a merger announcement by generating positive returns for the bidder's shareholders. The greater the efficiency the larger the CARs should be. High pre-merger bidder efficiency is so important that Aggarwal *et al*. (2006) find that in the three years prior to merger bidder profit efficiency improved considerably, suggesting that the involved firms prepared for the structural change by first improving performance, perhaps knowing how important it was for the market's reaction.

Pre-merger target efficiency

The literature suggests that bidders seek out less efficient banks to merge with. It is therefore preferred that the target's efficiency be lower than that of the bidder. The lower the efficiency of the target bank, the more likely that it will be improved after merger. A relatively low efficiency of the target is therefore expected to generate positive wealth gains for the bidder's shareholders.

Pre-merger bidder efficiency less Pre-merger target efficiency

With target efficiency expected to be lower than bidder efficiency, it follows that the difference between pre-merger bidder efficiency and target efficiency should preferably be large in order to generate positive wealth gains for the bidder's shareholders, as reflected in CARs.

Pre-merger Peer efficiency less Pre-merger target efficiency

In this case the argument is again that an efficient bidder can acquire a target with a below par performance and improve its efficiency, in this instance bring it to the level of its peers and preferably exceed that level. The market is expected to reward a bidder that acquires such a target with wealth gains on merger announcement, in anticipation of the desired efficiency improvement after merger. These market expectations will be reflected in the magnitude of the CARs. The larger the difference between peer and target efficiencies the larger the CARs that can be realized.

Pre-merger Peer efficiency less 1/2(bidder efficiency + target efficiency

This is an extension of the above argument to include the bidder. The logic is the same that as long as the rest of the firms in the same industry are performing better than the merging firms, the potential exists for efficiency improvement. The market therefore should reward the bidder's shareholders through wealth gains on merger announcement, by reflecting those expectations in CARs.

6.2.3 Control Variables

In addition to efficiency, six control variables that may influence abnormal returns are included in the model. They are considered in the following discussion.

Relative Size

This is the size of the target in total assets divided by that of the bidder. Experience shows that large firms target smaller institutions. This is done primarily to reduce transaction costs at the time of merger since these may be huge in mergers involving a large target. Similarly, bidders seek to avoid large integration costs post-merger which result from acquiring a large target. It may also be the case that merging with a large firm may cause the market to take longer to fully impound all relevant information in the share price, leading the market to initially misevaluate a firm, more likely negatively than positively because of the uncertainty over the firm's true valuation. Due to these reasons, it is expected that relative size will have a positive effect on the bidder's CARs upon merger announcement.

Cross

This is a dummy which equals *one* when the merger is cross-border and *zero* when it is domestic. A bank engaged in cross-border expansion faces greater challenges of integration and subsequent operations than one involved in a domestic merger. Therefore, in anticipation of those difficulties, the market is likely to react more negatively to a cross-border merger announcement than to that of a local deal, with less positive or negative CARs realized on merger announcement for the bidder.

Cash

A merger can be paid for by the bidder in cash or by offer of stock to the shareholders of the target bank, or by a combination of the two. Cash is a dummy which equals *one* when the payment is in cash and *zero* when it is by either of the other methods. Often, an offer of payment in stock is interpreted as meaning the bidder's management perceives their firm's stock as overvalued. Upon payment by stock, the stock price will decline, possibly to a more acceptable level. The new shareholders from the target's side will see this as a loss to them, and therefore consider themselves better off receiving cash rather than holding stocks in the combined firm. The bidder's ability to pay cash may also be interpreted positively by the market, as demonstrating its own liquidity and confidence of the benefits anticipated in the merger. For these reasons, payment in cash is expected to lead to positive CARs to the bidder on merger announcement.

Serial

The *serial* dummy is *one* for those mergers involving bidding banks which have engaged in more than one merger in the past three years and *zero* otherwise. Bidders that have acquired other banks recently are seen as having gained experience in managing the post-merger institution to produce the desired performance. For this reason, the market will react positively to merger announcements involving such firms. On the other hand, if the market is aware that some past mergers associated with those bidders did not improve performance after the transaction, it may react negatively to new deals involving those institutions. This will be the case also where the

general perception is that the managements of frequent acquirers do so in their own interests rather than that of their shareholders. Therefore, with respect to this variable, the market's reaction may lead to either a rise or a decline in the bidder's stock price and affect the CARs accordingly.

Dividend Payout

The record of a firm's practice with respect to dividend payment has a positive effect on the stock price. In fact, a strand of the finance literature advocates that a firm's stock price reflects the net present value of future earnings paid out as dividends to the shareholders. The dividend payout ratio used in this analysis is that of the bidder for the year immediately before merger. It is hypothesized that it has a positive effect on the stock price and therefore CARs.

Concentration

This refers to bank concentration in the target's country. It has been suggested that concentration is one of the determinants of bank profitability. High concentration lowers the cost of collusion among banks and may lead to higher profitability for all the banks in the market. Recognizing this, the market may react positively to a merger announcement and price the bidder's stock accordingly where the target is in a market with high bank concentration. On the other hand, entry of the new bank through merger may lower concentration and instead generate competition which may lead to higher bank efficiency. The possibility of this improved performance may again be interpreted positively by the market, giving rise to gains in the bidder's stock price and therefore CARs. Also, through the merger the combined bank may acquire such market power that it will be able to exercise control over the process of determining its charges and deciding the services to offer in order to maximize profits. In anticipation of this outcome, the market will react favourably for the bidder. Some studies find that concentration has a positive influence on bank profitability. However, there are other studies as well which find that its influence is either negative or non-existent. To this extent, the market' reaction to a merger announcement may also be the opposite of the expectations suggested in the above discussion.

6.2.4 Hypotheses of Interest

The discussions on efficiency and the control variables lead to the following hypotheses:

Hypothesis 1: Bidder efficiency has a positive effect on CARs.

Hypothesis 2: Target efficiency has a negative effect on CARs.

Hypothesis 3: All efficiencies involving the deduction of target efficiency from either bidder or peer efficiency have a positive effect on CARs.

Hypothesis 4: Both efficiencies involving deduction of the average of bidder and target efficiencies from peer efficiency have a positive effect on CARs.

Hypothesis 5: *Relative Size* and *Cross* have a negative effect on CARs.

Hypothesis 6: *Cash* and *Dividend Payout* have a positive effect on CARs.

Hypothesis 7: *Serial* and *Concentration* have a positive or negative effect on CARs.

6.2.5 Summary Statistics

The summary statistics of the cumulative abnormal returns and efficiency variables are presented in Table 6.1. Following Aggarwal *et al*. (2006) on which this study is based the two-day CARs first analyzed are those of the day before and the day of merger announcement ($CAR_{-1, 0}$). And following Kohers *et al*. (2000), the CARs analyzed for comparison purposes are those of the day of merger announcement and the next day ($CAR_{0, +1}$). The other variables are similar for both analyses.

Table 6.1 Summary Statistics for CARs and Efficiency Variables

Variable	Mean	Median	Maximum	Minimum	Std. Dev
$CAR_{-1, 0}$	0.9049	0.4621	3.9829	-0.5320	1.1582
$CAR_{0, +1}$	0.5758	0.3762	8.6164	-2.9926	1.7623
BIDCOSEFF	70.1966	66.8260	99.8976	63.7432	7.6413
BIDPFTEFF	55.2735	55.4970	98.7303	41.0688	9.6614
BIDTGTCOSEFF	-1.1977	-1.8022	30.5362	-34.2558	10.6042
BIDTGTPFTEFF	3.5604	0.9247	40.8617	-14.4282	12.4431
TGTCOSEFF	71.3942	69.3563	99.4048	65.3482	5.7841
TGTPFTEFF	51.7131	55.0747	97.9908	27.6701	8.6813
PRTGTCOSEFF	4.8801	2.5338	29.4569	-26.7391	8.8100
PRTGTPFTEFF	21.8752	24.3810	53.5524	-11.6374	18.5217
PRBDTGTCOSEFF	4.8803	1.7271	31.3935	-13.2840	7.7418
PRBDTGTPFTEFF	20.1030	17.6495	49.8726	-11.1697	17.6115
POSTCOS1EFF	-0.0162	-0.0035	0.0353	-0.0989	0.0363
POSTCOS2EFF	-0.0075	-0.0003	0.8896	-0.1225	0.0478
POSTCOS3EFF	-0.0285	-0.0123	0.0924	-0.1387	0.0610
POSTPFT1EFF	0.0260	0.0013	0.5208	-0.0627	0.1243
POSTPFT2EFF	0.0169	0.0024	0.1339	-0.0895	0.0559
POSTPFT3EFF	0.0126	0.0193	0.1392	-0.1290	0.0699

Note: The CAR variables have been described above. The other variables are defined as: BIDCOSEFF = bidder cost efficiency; BIDPFTEFF = bidder profit efficiency; BIDTGTCOSEFF = bidder cost efficiency less target cost efficiency; BIDTGTPFTEFF = bidder profit efficiency less target profit efficiency; TGTCOSEFF = target cost efficiency; TGTPFTEFF = target profit efficiency; PRTGTCOSEFF = peer cost efficiency less target cost efficiency; PRTGTPFTEFF = peer profit efficiency less target profit efficiency; PRBDTGTCOSEFF = peer cost efficiency less the average of bidder and target cost efficiency; PRTGTPFTEFF = peer profit efficiency less the average of bidder and target profit efficiency; POSTCOS1EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the first year; POSTCOS2EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the second year; POSTCOS3EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the third year; POSTPFT1EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the first year; POSTPFT2EFF = difference between pre-merger profit efficiency

and post-merger profit efficiency for the second year; POSTPFT3EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the third year.

Table 6.2 Summary Statistics for Control Variables

Variable	Mean	Median	Maximum	Minimum	Std. Dev
RSIZE	0.1668	0.0470	1.7914	0.0011	0.3118
CROSS	0.6071	1.0000	1.0000	0.0000	0.4928
CASH	0.5179	1.0000	1.0000	0.0000	0.5042
SERIAL	0.5000	0.5000	1.0000	0.0000	0.5045
DIVPAY	52.1214	52.1150	97.04	0.0000	25.0881
CONC	0.5829	0.6109	0.9828	0.3027	0.1882

Note: The above variables are defined as: RSIZE = relative size of target to bidder in total assets; CROSS = 1 when merger is cross-border and 0 when it is domestic; CASH = 1 when deal payment is made in cash and 0 when it is stock or combination of cash and stock; SERIAL = 1 when a bidder has been involved in another acquisition in the past three years and 0 otherwise; DIVPAY = dividend payout ratio calculated as dividend divided by net income; CONC = concentration calculated as assets of the three largest banks in a market divided by total assets of all banks in that market.

6.3 Empirical Results

The efficiency variables discussed above require that ten regressions be performed to analyze the impact of pre-merger efficiency. Post-merger efficiency requires eight regressions, making a total of eighteen regressions. However, for a larger picture, the regressions performed exceed this number by far due to the need for getting an impression of how the results may change markedly by simply using a different event window in the analysis or limiting the number of control variables, both based on the two U.S. studies that inspired this investigation.

The results of regressions performed to find out the influence of pre-merger efficiency on the market's reaction to a bank merger announcement are presented in Tables 6.3 to 6.22 at Appendix 6.1. The first half of the results is based on the combined abnormal returns of the day before and the day of merger announcement ($CAR_{-1, 0}$). For comparison purposes, the second half relates to the sum of two-day abnormal returns, the merger announcement day and the

following day ($CAR_{0, +1}$). The results of regressions performed to find out the influence of post-merger efficiency on the market's reaction to a bank merger announcement are presented in Tables 6.25 to 6.40 at Appendix 6.2. The first half of the results is based on $CAR_{-1, 0}$. And, once again for comparison purposes, the second half relates to $CAR_{0, +1}$.

CARs of the two-day window combining the day before and the announcement day, which are the focus of this investigation, were first investigated by Aggarwal *et al*. (2006). CARs of the two-day window combining the announcement day and the day after, which are investigated for comparison purposes, were investigated by Kohers *et al*. (2000), apparently the first researchers to undertake this kind of study. In other words, analyses are compared between those pertaining to $CAR_{-1, 0}$, the focus of this study, and those based on $CAR_{1, 0}$. Comparison is also made between analyses involving six control variables (this study, based primarily on Aggarwal *et al*., 2006) and those using only three control variables (based on Kohers *et al*., 2000). The results pertaining to regressions using three control variables are presented in Table 6.43 to Table 6.62 at Appendix 6.3 for pre-merger efficiency, and in Table 6.63 to Table 6.78 at Appendix 6.4 for post-merger efficiency, but they are not discussed.

Diagnostic Tests

Before the analyses described were performed, several diagnostic tests were carried out to find out the suitability of the data for multiple regression. The results are presented in Appendix 6.x. Reading from the Ramsey RESET test results, only three of the eighteen test outcomes are statistically significant, rejecting the null hypothesis that there is nothing wrong with the model. On the basis of the larger number of results, the model is well specified. With respect to heteroskedasticity, none of the Obs*R-squared values has a p-value corresponding to a significant result. The null hypothesis that the original model is homoskedastic is therefore not rejected. For this reason, heteroskedasticity does not pose an obvious problem in the regressions performed. As for multicollinearity among the explanatory variables, correlation analysis shows that correlations are very low, indicating suitability of all the variables for use in the regressions.

Just in case there is a negative aspect of one or more variables that the correlation analysis may have failed to detect, collinearity diagnostics were also performed, and Tolerance and VIF[20] were reported for each variable. Common usage has established 0.1 as the value below which Tolerance should not fall. Similarly, VIF should not exceed 10. In the results presented in Appendix 6.x, the lowest Tolerance value is 0.568, while the highest VIF amount is 1.760. On the basis of these results and those of the correlations, multicollinearity is ruled out, making all the independent variables suitable for inclusion in the regressions.

Turning to normality, when the residuals are symmetrically distributed around zero, their skewness is zero. And the kurtosis of a normal distribution is 3. In the results presented in Appendix 6.5, most of the Skewness values are around 0.5 or less, while the larger number of the Kurtosis values are around 3. On account of these results we cannot reject the null hypothesis that the residuals are normally distributed. Also, all the p-values of the Jarque-Bera statistic exceed the 5% level of statistical significance, confirming that we cannot reject the null hypothesis. As for a measure of goodness of fit, R^2 is reported in all the results presented in the Tables in Appendices 6.1 to 6.4. Most of the regressions performed using pre-merger efficiency and six control variables have R^2 values between 0.40 and 0.50. Also, as reported below, the overwhelming majority of the variables have the expected sign, indicating a direction of influence which is consistent with theory. Regressions performed using post-merger efficiency and six control variables mostly have R^2 values ranging from 0.75 to 0.85. Again, the majority of the variables have the expected sign. Results with the lowest R^2 values pertain to those regressions performed for comparison purposes using only three of the six control variables following the first study that investigated this area (Kohers *et al*., 2000). In those regressions, most of the R^2 values are between 0.30 and 0.45, an acceptable range by many standards. Overall, the regressions performed in this study produce R^2 values that show that the data used fit the model well. Considered together with the other diagnostic test results, the goodness of fit results demonstrate the suitability of the data and model for the analyses performed.

Small Sample

[20] VIF is variance inflation factor

Before the results are presented, a few remarks about the smallness of the sample used in this study may be appropriate at this stage. Compared to other studies that have investigated efficiency in bank mergers, the sample size of 56 mergers used in this study is very small. Most studies examine sample sizes above a hundred and many, especially US studies, investigate hundreds and even thousands of merging firms. As for the two U.S. studies from which this research mainly borrows, Aggarwal *et al.* (2006) investigates 271 bank mergers, while Kohers *et al*. (2000) look at 94 deals.

What is most noticeable when small sample sizes are used in regressions is lack of or minimal statistically significant results as it is the case in this study. Where there is statistical significance, the main problem that arises from the use of small samples is that inferences made from the results cannot be generalized. In other words, the results are important for that study alone, and are rarely useful for any other use. Different authors suggest different sample sizes for research in the social sciences. For regression purposes, for example, it has been suggested that sample size be dependent on the number of explanatory variables, like N>50+8m (m=explanatory variables) proposed by Tabachnik and Tehranian (2007, p. 123). Using this suggestion, the desirable sample for this study should have been at least 106 (50 + 8*7 variables) mergers. On the other hand, with respect to post-merger efficiency regressions where a sample of 20 is used, a desirable sample of 106 mergers in the three years analyzed would have meant an average of at least 35 mergers per year. Extending this to the seven years investigated means that a total of 245 mergers would have been needed. Other authors would recommend a larger or smaller sample depending on data properties. These levels of sample size may be obtained in European mergers only if the institutions being investigated are of a general nature, for example, all financial institutions.

In this study, if data had been available more mergers would have been included in the sample to make sure that there were enough yearly deals for carrying out the desired regressions and make the appropriate yearly efficiency comparisons. It would also have minimized the influence of any outliers in the calculation of abnormal returns.

6.3.1 Regression Results on Pre-merger Efficiency

6.3.1.1 $CAR_{-1, 0}$ Regression Results on Pre-merger Efficiency

Tables 6.3 to 6.12 present regression results for the two-day CARs pertaining to the day before and the merger announcement day. A brief summary of the results is given under each table, commenting selectively on the efficiency variable and those of the control variables with significant results.

Table 6.3 results show that pre-merger bidder cost efficiency has a positive influence on the market's reaction to merger announcement, in conformity with Hypothesis 1 above. This is what is desired as the bidder bank's pre-merger performance should contribute positively to its shareholders' wealth creation. However, the bidder cost efficiency's coefficient is not statistically significant. The control variable with the most positive influence on the CARs is CASH with the largest coefficient, and it is also statistically significant at the 10% level. Since the coefficient has a positive sign, in conformity with Hypothesis 6, it means that the market is confident that those combined banks formed out of payment in cash will be able to achieve the anticipated outcomes of the merger. The CROSS variable is negative as expected in Hypothesis 5 and statistically significant at the 5% level. This is a strong indication of the market's perception that cross-border mergers will face more difficulty than domestic deals in realizing their post-merger performance expectations. SERIAL is also negative as assumed in Hypothesis 7, and statistically significant at the 10% level. This is an indication that the market does not view the serial acquisitions involving firms included in the sample as having been undertaken in the interest of the bidders' shareholders. DIVPAY is positive as conceived in Hypothesis 6 and statistically significant at the 10% level. This can be interpreted to mean that the market recognizes the potential for improving performance post-merger by those firms with a good previous record of profitability that enabled them to pay dividends.

Save for lack of statistical significance, the results are consistent with Pilloff (1996) who reports that CARs are correlated with economic efficiency.

In Table 6.4 the results show that pre-merger bidder profit efficiency has a positive effect on cumulative abnormal returns which is statistically significant at the 5% level. This is expected since the market takes account of a firm's previous performance in reacting to a merger announcement, and is in conformity with Hypothesis 1. Of the control variables, CASH has the highest positive coefficient, which is also statistically significant at the 10% level. Positive results are as expected in Hypothesis 6, with the market favoring in its valuation those mergers where payment is made in cash rather than stock. CROSS is negative as expected according to Hypothesis 5, as cross-border mergers are viewed as more likely than domestic deals to experience serious challenges of achieving their post-merger forecasts. The result is also statistically significant at the 5% level. The DIVPAY variable is positive as assumed in Hypothesis 6, and statistically significant at the 10% level. This suggests that the market recognizes the ability to pay dividends as an indicator of performance and that those firms with a good history of fulfilling their dividend pay obligations are likely to achieve their post-merger objectives.

These results can be compared with those of Cornett and Tehranian (1992) who find that post-merger financial performance is correlated with CARs.

Table 6.5 results show that the difference in pre-merger bidder cost efficiency and target cost efficiency has a positive influence on CARs as assumed in Hypothesis 1. However, this outcome does not meet the main criterion for a positive result because pre-merger the targets are more cost efficient than bidders, leaving little room for cost efficiency improvement on the target side of the combined firm. Nevertheless, since the difference in pre-merger cost efficiency is small, the market may perceive improvement in performance in the combined firm that is not necessarily in conformity with theory. It is to be noted, however, that the result is not statistically significant. The control variable with the most influence on CARs which is also positive in conformity with Hypothesis 6 is CASH. The result is also statistically significant at the 5% level. This is a strong reaction from the market suggesting a perception that combined firms formed from mergers paid for in cash stood a good chance of performing better than those firms

resulting from stock-paid mergers. CROSS, as expected in Hypothesis 5 is negatively associated with CARs, and the result is statistically significant at the 5% level. This result reinforces the view that cross-border mergers may not perform as well as domestic deals post-merger due to the challenges of integrating with a foreign firm and managing cross-border operations. The DIVPAY variable is positive as presumed in Hypothesis 7 and statistically significant at the 10% level. The market's reaction in this case is consistent with the view that as a general rule firms that pay dividends are better than those that do not, and can therefore be expected to produce a good post-merger performance.

In all the three results reported so far, CASH is positive and statistically significant. The results are consistent with those of studies that report that mergers paid for in cash create more shareholder wealth for the bidders (Hawawini and Swary, 1990).

In Table 6.6 the results show as expected in Hypothesis 1 that the difference between pre-merger bidder profit efficiency and target profit efficiency has a positive influence on CARs. The result is also statistically significant at the 5% level. A view is conveyed by the market here that there is room for post-merger performance improvement that can be beneficial to the combined firm's shareholders. CASH has the highest coefficient among the control variables which, as suggested in Hypothesis 6, is positive. It is also statistically significant at the 10% level. As we have seen above, this is an indication of the market's perception that mergers paid for in cash give rise to institutions that outperform those arising from stock-paid mergers. The CROSS variable has a negative sign as presumed in Hypothesis 5 and is statistically significant at 5%. This is a strong reaction from the market confirming what theory suggests that, compared to domestic mergers, cross-border deals face many obstacles post-merger that may restrain or delay post-merger performance expectations. DIVPAY, as expected in Hypothesis 6 has a positive sign and is statistically significant at the 5% level. In its evaluation of a firm's stock, a market takes its performance with regard to dividend payment as an indication of interest in the shareholders as owners of the firm, and historical dividend payments as a predictor of future performance.

The persistence of positive and statistically significant results for DIVPAY so far is an indication of the influence of this variable on shareholder wealth creation and they are consistent with those reported by Olson and Pagano (2005).

The results presented in Table 6.7 show that target cost efficiency has a negative influence on CARs and that it is statistically significant at the 5% level. This result conforms to Hypothesis 2. When the target's efficiency is high pre-merger, it means there is little potential for it to rise significantly post-merger. Realizing this, the market reacts accordingly. At face value, CASH is the control variable with the most influence on CARs, which is positive as expected in Hypothesis 6. Its statistical significance at the 5% level suggests that the market has a strong view that cash-paid as opposed to stock-paid merger deals will result in combined firms that produce superior post-merger performance. As expected, CROSS has a negative influence on CARs in conformity with Hypothesis 5. It is also statistically significant at the 5% level. The perception of the market in this case, as before, is that combined firms formed from cross-border merger deals will experience obstacles post-merger that may inhibit or delay the realization of post-merger performance improvements, unlike their counterparts borne out of domestic deals.

The costt efficiency result is consistent with Kohers et al. (2000). The variable CROSS has so far been negative as expected and statistically significant, in conformity with the hypothesis that cross-border mergers are likely to create less wealth in a merger announcement. These results are consistent with those of DeLong (2000b).

In Table 6.8 the results show that target profit efficiency has a positive influence on CARs, although it is not statistically significant. The result does not conform to Hypothesis 2. CASH has the most influence on CARs at face value among the control variables. It is also positive as expected in Hypothesis 6, and statistically significant at the 5% level. As in previous results discussed above, the market views cash-paid merger deals as leading to combined firms that are more likely to succeed post-merger than those formed from stock-paid mergers. CROSS has a

negative effect on CARs as expected in Hypothesis 5 and is also statistically significant at the 5% level. This conveys the information that the market considers cross-border mergers as susceptible to integration and other challenges that can stall the realization of post-merger performance improvements.

Although theory suggests that the target's profit efficiency has a negative effect on the bidder's CARs, sufficiently profit efficient targets have been found to contribute positively and significantly to the bidders' wealth creation (Beitel *et al*., 2004). This may be because they are perceived by the market to be likely to improve further under a better management post-merger. Theory remains unaffected by this or similar findings.

Table 6.9 reports results that show that the difference between peer cost efficiency and target cost efficiency has a positive influence on CARs, and is also statistically significant at the 5% level. This result conforms to Hypothesis 3 and is consistent with the theory in that where the target lags behind its peers in efficiency there is potential for the combined firm to implement improvements that can raise the level of efficiency of the target part of the new institution to that of peers and above. The only control variable with a significant result is CASH. Its influence on CARs is positive as expected in Hypothesis 6 and it is significant at the 5% level. This supports the theory that, post-merger, firms created from cash-paid mergers will outperform those formed from stock-paid deals.

These results are consistent with those of Kohers et al. (2000) who also find that the larger the gap in cost efficiency between the target and peers the greater its positive effect on the bidder's abnormal returns.

In Table 6.10 the results show that, contrary to Hypothesis 3, the difference between peer profit efficiency and target profit efficiency has a negative effect on CARs which, however, is not statistically significant. This is also not the expected result, as according to theory the greater the difference between peer efficiency and bidder or target efficiency the greater the likelihood of post-merger performance improvement. This unexpected result can be explained by the huge

difference between peer profit efficiency and target profit efficiency represented by the large mean in the descriptive statistics presented in Table 6.1 above. Apparently, theory does not cover cases of extreme differences in efficiency. In this particular case, maybe even the most optimistic market will consider it unreasonable to expect the combined firm to raise the level of target efficiency to peer level in the short-term, while not risking prediction in the long-term. Of the control variables, CASH has the largest coefficient which, as expected in Hypothesis 6, is positive. The result is also statistically significant at the 5% level, suggesting confidence of the market in cash-paid mergers giving rise to combined firms that will out-perform counterparts borne out of stock-paid mergers. CROSS has the expected negative sign according to Hypothesis 5, which is also statistically significant at the 5% level. With this result, the market is conveying the information that cross-border mergers are more likely than domestic mergers to produce firms that may experience delays in achieving post-merger performance improvements envisaged at the time of merger.

These results differ from those of Kohers *et al*. (2000) on account the targets' profit efficiency being too low. There probably is a level of target efficiency below which post-merger improvements may not be expected in the foreseeable future and under which most acquirers would not bid. Nevertheless, the literature is silent on this matter.

In Table 6.11 we note that the difference between peer cost efficiency and the average of bidder cost efficiency plus target cost efficiency has a positive effect on the market's reaction to merger announcement as expected as expected in Hypothesis 4. The result is also statistically significant at the 5% level. Theory suggests that where the bidder or target or both have lower efficiency than their peers then the chances of realizing post-merger performance improvements increase. The above result is consistent with the market's recognition of this possibility. CASH is the only control variable with a significant result at the 5% level, and it has the expected positive effect on CARs as predicted in Hypothesis 6. This suggests that the market perceives that cash-paid mergers are more likely than stock-paid deals to produce combined firms that can accomplish post-merger performance improvements predicted at the time of merger.

The efficiency findings are consistent with those reported in Kohers *et al*. (2000).

Table 6.12 presents results that show that the difference between peer profit efficiency and the average of bidder profit efficiency plus target profit efficiency has a negative effect on the market's reaction to merger announcement. This result is contrary to Hypothesis 4. However, the result is not statistically significant. That notwithstanding, the negative effect is the opposite of what is suggested by theory. A possible reason for this outcome is the same as that pointed out in the discussion on Table 6.10 results that the difference between peer profit efficiency and target profit efficiency is rather large. Therefore the explanation is similar to that provided earlier that, on account of that difference, the market perceives that it will take considerable time for the combined firm to realize the desired post-merger improvements. Surprisingly, CASH also has a negative effect on the CARs which, in addition, is statistically significant. This is contrary to Hypothesis 6 expectations. It is possible for a result like this to happen, but only on very rare occasions. One possible explanation for this possibility may be considered.

If a firm has very few profitable investment opportunities, it will accumulate cash. Such cash may be used in two main ways, the obvious one being paying it out as dividends to shareholders. This is sometimes difficult to do because it may offset an established level of dividend pay-out that the firm wishes to adhere to for consistency and stability. The other way for outlaying the cash is by buying another firm, especially when there is a merger wave, as it is the case in this example. In some cases, where a part of the management's remuneration is pegged on the size of the firm, the management will prefer this option. A market with this information may consider a firm with few investment opportunities taking over another with a rather low profit efficiency compared to its peers as unlikely to be able to improve post-merger performance early enough for the reaction to merger announcement to be positive. Hence, the result obtained.

CROSS has a negative effect on CARs as expected in Hypothesis 5, and the result is significant at the 5% level. This shows a strong perception by the market that, unlike their domestic counterparts, combined firms borne out of cross-border mergers will experience considerable

difficulties post-merger that may delay the realization of performance improvements predicted at the time of merger.

These results differ from those of Kohers *et al*. (2000) on account of the targets' profit efficiency being too low. There must be a hurdle level of target efficiency below which most acquirers would probably not bid, and post-merger improvements would not be expected in the foreseeable future. However, this is not raised in the literature.

6.3.1.2 $CAR_{0,+1}$ Regression Results on Pre-merger Efficiency

Tables 6.13 to 6.22 present regression results for the two-day CARs pertaining to the merger announcement day and the following day. A brief summary of the results is given under each table, commenting selectively on the efficiency variable and those of the control variables with significant results.

Throughout the results presented, CASH is positive and statistically significant at the 5% level. The results are consistent with Hawawini and Swary (1990). The only other control variable that is statistically significant is SERIAL, with a negative sign suggesting that the mergers analyzed may have been carried out in the interest of the bidder's management and not that of the shareholders. Sometimes managements overpay in mergers, overestimate post-merger savings, or underestimate the complexity of running the larger institution arising from merger. If the market perceives this it will react accordingly to the merger announcement. The SERIAL result corresponds to the findings of Hagendorff *et al*. (2008).

In Table 6.13 the results show that, contrary to Hypothesis 1, bidder cost efficiency has a negative influence on the CARs, although the result is not statistically significant. This is an unexpected result, as previous bidder performance is expected to be of a level that will lead to the market reacting positively to the announcement of a merger in which it is involved. It will be noted that in Table 6.3 above, bidder cost efficiency has a positive effect on CARs, even if it is not statistically significant. It is obvious that since, except for the CARs, all the other variables used in the two analyses are the same, the reason for the different results may lie in the CARs.

Also, it may be noted from the descriptive statistics presented in Table 6.1 that the mean of $CAR_{-1, 0}$ is about one and a half times that of $CAR_{0, +1}$, and yet the maximum value of the latter is almost twice that of the former. In addition, the minimum absolute value of $CAR_{0, +1}$ is about six times as large as the minimum absolute value of $CAR_{-1, 0}$, both values being negative. Lastly, the standard deviation of $CAR_{0, +1}$ is about one and a half times that of $CAR_{-1, 0}$. It can be observed from this that there are much more fluctuations among firms in $CAR_{0, +1}$ than in $CAR_{-1, 0}$. These differences may have led to the unexpected result of BIDCOSEFF. There is otherwise no ready explanation for this result based on either theory or the literature.

In Table 6.14 the results show that the effect of bidder profit efficiency on CARs is positive as expected in Hypothesis 1. The pre-merger performance of the bidder should have a positive influence on the market's reaction in any merger where the bidder wishes to demonstrate ability to improve on previous profitability in post-merger performance and therefore wealth creation for the combined firm's shareholders. The result is therefore consistent with theory. Save for lack of statistical significance, the results can be compared with those of Cornett and Tehranian (1992) who find that post-merger financial performance is correlated with CARs.

Table 6.15 shows that, as expected in Hypothesis 3, the difference between bidder cost efficiency and target cost efficiency has a positive effect on CARs. Theory posits that where an efficient firm takes over a less efficient one, the bidder may implement changes in various areas of the combined firm that may lead to post-merger performance improvements. The market will react accordingly where that is the case. Save for lack of statistically significance, the results are consistent with Kohers *et al*. (2000).

Table 6.16 reports results which show, as expected in Hypothesis 3, that the difference between bidder profit efficiency and target profit efficiency has a positive effect on the market's reaction to merger announcement. The results are consistent with theory, although they are not statistically significant. Save for lack of statistically significance, the results are consistent with Aggarwal *et al*. (2006).

Table 6.17 presents results that show that target cost efficiency has a negative effect on the market's reaction to merger announcement as predicted in Hypothesis 2. The results would be consistent with Kohers *et al*. (2000), if they were statistically significant.

In Table 6.18 the results show that target profit efficiency has a positive effect on CARs, contrary to what is predicted in Hypothesis 2. However, the result is not statistically significant. Although theory suggests that the target's profit efficiency has a negative effect on the bidder's CARs, Beitel *et al*. (2004) find that sufficiently profit efficient targets contribute positively and significantly to the bidders' wealth creation. The market might perceive them as likely to improve further under a better management post-merger. Theory remains unaffected by this or similar findings.

The results presented in Table 6.19 show that the difference between peer cost efficiency and target cost efficiency has a positive effect on CARs as expected in Hypothesis 3. According to theory, the difference between peer and target efficiency signifies existence of potential for improvement of target efficiency to the level of its peers and beyond. Save for lack of statistically significance, these results are consistent with those of Kohers et al. (2000) who also find that the larger the gap in cost efficiency between the target and peers the greater its positive effect on the bidder's abnormal returns.

Table 6.20 reports results which show that the difference between peer profit efficiency and target profit efficiency has a negative effect on CARs which is inconsistent with theory and the prediction of Hypothesis 3. The result can be attributed to the very large difference between the peer and target efficiencies, leading the market to consider it unlikely that the targets' efficiency level can be brought to that of the peers as quickly as desirable. It is to be noted, however, that the result is not statistically significant. These results differ from those of Kohers *et al*. (2000) on account of the targets' profit efficiency being too low. There probably is a level of target efficiency below which post-merger improvements may not be expected in the foreseeable future and under which most acquirers would not bid. Nevertheless, the literature is silent on this matter.

Table 6.21 presents results which show that the difference in peer cost efficiency and the average of bidder and target cost efficiency has a positive influence on CARs as expected in Hypothesis 4, although the result is not statistically significant. The result is consistent with theory, which suggests that where that difference exists it represents potential for improvement to peer-level efficiency and beyond, and the market recognizes that. With statistical significance, the findings would be consistent with those reported in Kohers *et al*. (2000).

In Table 6.22, the difference between peer profit efficiency and the average of bidder plus target profit efficiency is reported to have a negative effect on CARs, which is not what is predicted in Hypothesis 4. This result is the opposite of theory. It is possible that the market would react as it did in the light of the large difference between peer efficiency and target efficiency. The result differs from that of Kohers *et al*. (2000) on account of the targets' profit efficiency being too low. A hurdle level of target efficiency might exist below which most acquirers would probably not bid, and post-merger improvements would not be expected in the foreseeable future. However, this is not raised in the literature. It should be noted that the result is not statistically significant.

6.3.1.3 Summary of Results

To get an overall picture of the above results, they are summarized in Table 6.23 below. Comments on the summary dwell mainly on the efficiency variable.

Table 6.23 Summary of Significant Results for Efficiency and Control Variables - Main Analysis

Variables	Frequency of Significant Result			
	$CAR_{-1, 0}$		$CAR_{0, +1}$	
	5% Level	10% Level	5% Level	10% Level
BIDCOSEFF	0	0	0	0
BIDPFTEFF	**1(+)**	0	0	0
BIDTGTCOSEFF	0	0	0	0
BIDTGTPFTEFF	0	**1(+)**	0	0
TGTCOSEFF	**1(-)**	0	0	0
TGTPFTEFF	0	0	0	0

PRTGTCOSEFF	**1(+)**	0	0	0
PRTGTPFTEFF	0	0	0	0
PRBDTGTCOSEFF	**1(+)**	0	0	0
PRBDTGTPFTEFF	0	0	0	0
SUB-TOTAL	**4**	**1**	**0**	**0**
RSIZE	0	0	0	0
CROSS	**8(-)**	0	0	0
CASH	**7(+)**	**3(-)**	**10(+)**	0
SERIAL	0	**1(-)**	0	**1(-)**
DIVPAY	**1(+)**	**4(+)**	0	0
CONC	0	0	0	0
SUB-TOTAL	**16**	**8**	**10**	**1**
F-STATISTIC	0	0	0	**9**
TOTAL	**20**	**9**	**10**	**10**

Note: As before, the above variables are defined as: BIDCOSEFF = bidder cost efficiency; BIDPFTEFF = bidder profit efficiency; BIDTGTCOSEFF = bidder cost efficiency less target cost efficiency; BIDTGTPFTEFF = bidder profit efficiency less target profit efficiency; TGTCOSEFF = target cost efficiency; TGTPFTEFF = target profit efficiency; PRTGTCOSEFF = peer cost efficiency less target cost efficiency; PRTGTPFTEFF = peer profit efficiency less target profit efficiency; PRBDTGTCOSEFF = peer cost efficiency less the average of bidder and target cost efficiency; PRTGTPFTEFF = peer profit efficiency less the average of bidder and target profit efficiency; RSIZE = relative size of target to bidder in total assets; CROSS = 1 when merger is cross-border and 0 when it is domestic; CASH = 1 when deal payment is made in cash and 0 when it is stock or combination of cash and stock; SERIAL = 1 when a bidder has been involved in another acquisition in the past three years and 0 otherwise; DIVPAY = dividend payout ratio calculated as dividend divided by net income; CONC = concentration calculated as assets of the three largest banks in a market divided by total assets of all banks in that market.

$CAR_{-1, 0}$ Results

With regard to $CAR_{-1, 0}$, the results presented in Table 6.23 reveal that in the sample examined, overall the level of target cost efficiency had the most notable influence on the bidders' CARs, either when examined as the difference with peer cost efficiency, or as the difference between peer cost efficiency and the average of bidder plus target cost efficiency. This result can be associated with the findings of those studies that have suggested that after merger European banks pursue cost-cutting strategies while seeking to enhance efficiency (Hagendorff and Keasey, 2009). It is possible that bidders aim to combine with firms that may make such strategies easier to achieve. Peer efficiency and how it differs with both bidder and target efficiency is shown to be influential on the market's reaction to merger announcement. It can be inferred from the above results that the potential for post-merger improvements in efficiency is associated with, in addition to other variables, how large peer efficiency is compared to that of

target or both bidder and target. This finding is consistent with the results reported by Kohers *et al*. (2000). Bidder profit efficiency, standing alone, or included in the difference between itself and target profit efficiency, represents another notable influence on the bidders' CARs. From Table 5.5 it can be seen that bidders are more profit efficient than targets while the reverse is the case for cost efficiency. It is therefore possible that bidders in the sample under investigation are good at making profits but poor at controlling costs and presume that by combining with firms that are good at the latter they can enhance their profitability. Aggarwal *et al*. (2006) also find that bidder profit efficiency, more than any other variable, is positively associated with CARs, and that the relationship is statistically significant.

Of the control variables, CROSS and CASH have the most influence on the market's reaction to bank merger announcements which is also statistically significant. The market perceives combined firms formed out of cross-border mergers as less likely than those from domestic deals to achieve timely their post-merger performance improvement objectives. This is because of the challenges of integrating with an overseas institution and managing operations from a distance with many obstacles to surmount, especially in the years immediately following merger. Similarly, the market demonstrates confidence in the ability of institutions resulting from cash-paid mergers to achieve quicker and sometimes greater post-merger performance goals compared to their counterparts created out of stock-paid deals. Other control variables with a significant influence on CARs are DIVPAY (5% and 10%), RSIZE (5%), and SERIAL (10%).

$CAR_{0,+1}$ Results

As for $CAR_{0,+1}$, none of the efficiency variables has a significant result. What this unexpected result seems to suggest is that findings in such a study may differ substantially depending on which window's CARs are used as dependent variable. Since this is a topic which is yet to be widely researched, no guidelines exist on a most appropriate window for investigation.

Regarding control variables, CASH is statistically significant at the 5% level in all the ten regressions, while SERIAL is statistically significant at the10% level in one regression.

6.3.1.4 Additional Analysis on Pre-merger Efficiency

It can be observed from the above presentation that there is a substantial difference between the results where $CAR_{-1, 0}$ is the dependent variable and those where $CAR_{0, +1}$ is used. Specifically, in the latter, none of the efficiency variables is statistically significant, while, of the control variables, only CASH and SERIAL are. Since this study was undertaken along the lines of both Aggarwal *et al*. (2006) and Kohers *et al*. (2000), consideration was given to the fact that the latter had only three control variables, namely RSIZE, CROSS (actually used INTERSTATE), and CASH (actually used STOCK). Additional regressions were therefore performed using only these control variables for comparison purposes. The outcomes of those regressions are presented in Tables 6.43 to 6.62 at Appendix 6.3, and they can be interpreted individually along the same lines as the results considered above. Also, a summary is presented in Table 6.24, followed by a brief discussion.

Table 6.24 Summary of Significant Results for Efficiency and Control Variables - Additional Analysis

Variables	Frequency of Significant Result			
	$CAR_{-1, 0}$		$CAR_{0, +1}$	
	5% Level	10% Level	5% Level	10% Level
BIDCOSEFF	0	0	0	**1(-)**
BIDPFTEFF	0	0	0	0
BIDTGTCOSEFF	0	0	0	0
BIDTGTPFTEFF	0	0	0	0
TGTCOSEFF	0	**1(-)**	0	0
TGTPFTEFF	0	0	0	0
PRTGTCOSEFF	**1(+)**	0	0	0
PRTGTPFTEFF	0	0	0	0
PRBDTGTCOSEFF	0	0	0	0
PRBDTGTPFTEFF	0	0	0	0
SUB-TOTAL	**1**	**1**	**0**	**1**
RSIZE	0	0	0	0
CROSS	**1**	0	0	0
CASH	0	0	**10**	0
SUB-TOTAL	**1**	**0**	**10**	**0**
F-STATISTIC	0	0	**2**	**7**

TOTAL	**2**	**1**	**12**	**8**

Note: As before, the above variables are defined as: BIDCOSEFF = bidder cost efficiency; BIDPFTEFF = bidder profit efficiency; BIDTGTCOSEFF = bidder cost efficiency less target cost efficiency; BIDTGTPFTEFF = bidder profit efficiency less target profit efficiency; TGTCOSEFF = target cost efficiency; TGTPFTEFF = target profit efficiency; PRTGTCOSEFF = peer cost efficiency less target cost efficiency; PRTGTPFTEFF = peer profit efficiency less target profit efficiency; PRBDTGTCOSEFF = peer cost efficiency less the average of bidder and target cost efficiency; PRTGTPFTEFF = peer profit efficiency less the average of bidder and target profit efficiency; RSIZE = relative size of target to bidder in total assets; CROSS = 1 when merger is cross-border and 0 when it is domestic; CASH = 1 when deal payment is made in cash and 0 when it is stock or combination of cash and stock; SERIAL = 1 when a bidder has been involved in another acquisition in the past three years and 0 otherwise; DIVPAY = dividend payout ratio calculated as dividend divided by net income; CONC = concentration calculated as assets of the three largest banks in a market divided by total assets of all banks in that market.

$CAR_{-1, 0}$ Results

Reporting on $CAR_{-1, 0}$ regressions, Table 6.24 presents a summary that shows again that target cost efficiency seems to be the most influential variable on CARs in the sample examined, as considered in its difference with peer cost efficiency. Target efficiency has a negative influence on CARs as expected. CROSS is shown to be influential and statistically significant at the 5% level but in only one out of ten regressions.

$CAR_{0, +1}$ Results

As for $CAR_{0, +1}$ regression results, bidder cost efficiency is the only efficiency shown to influence CARs, unexpectedly negatively, and is statistically significant at the 10% level. In Table 6.23 above none of the efficiencies was statistically. CASH is shown once again to be the most influential control variable for the same reasons discussed above. All the ten regressions yielded results which are statistically significant at the 5% level.

6.3.2 Regression Results on Post-merger Efficiency

Having examined the effect of pre-merger efficiency on CARs, the study also investigated post-merger efficiency and how it is associated with the market's reaction to merger announcement. At Appendix 6.2, Table 6.25 to Table 6.32 present regression results for $CAR_{-1, 0}$, while Table 6.33 to Table 6.40 present results for $CAR_{0, +1}$. Regressions were performed using as the efficiency variable the difference between pre-merger efficiency of the combined firm and the post-merger efficiency. Results are presented for each year individually for the first three post-merger years and the average of those three years. As reported in Chapter Five, pre-merger

efficiency of the combined firm was obtained by adding up bidder and target pre-merger efficiency, after weighting them on the basis of their total assets.

The analysis of post-merger efficiency is based on two basic assumptions found in the finance literature. The first of these is grounded in the efficient market hypothesis, the semi-strong form of which posits that even information not publicly available is perceived by the market. Markets exist which are efficient in the semi-strong form, as implied by DeLong and DeYoung (2007) in the quotation at the beginning of the chapter. In a market that is efficient in the semi-strong form, it is likely that market participants, some of them with insider information, would influence the market through their trading. This possibility culminates in markets being able to predict a firm's future performance, one indicator of which is efficiency, as it is the case in this investigation. The second assumption is based on that part of the literature which suggests that a stock's price reflects the future earnings performance of the firm. And abnormal returns are the product of price movement.

Since no other studies have investigated this area, it should be noted that the results can be compared in a limited way with the findings of only Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006). This is because the former study is too brief in investigation as well as reporting, while the latter addresses only profit efficiency. Results that can be compared with the findings reported by these authors are only those that were investigated by the two studies. In the following discussions, where the result is associated with one or both of these studies the literature is cited accordingly.

6.3.2.1 $CAR_{-1, 0}$ Regression Results on Post-merger Efficiency

Tables 6.25 to 6.32 present regression results for the two-day CARs pertaining to the day before and the merger announcement day. A brief summary of the results is given under each table, commenting selectively on the efficiency variable, as the focus, and those of the control variables with significant results.

According to the results presented in Table 6.25, post-merger cost efficiency of the combined firm for the first year has a positive effect on CARs. This is the desired prediction but it is not consistent with the result obtained in Chapter Five where cost efficiency declines in the first year for mergers that took place in 2001, 2002, and 2003. It should be noted, however, that the result is not statistically significant.

Regarding the control variables, CROSS is shown to have a positive rather than negative effect on CARs which is statistically significant at the 5% level. This suggests cross-border mergers will perform better than domestic deals, presumably on account of cross-border bidders having had previous experience overseas, or because in the first year they can continue with a profitability trend that started prior to merger, before the effects of merging with a cross-border firm are felt. SERIAL has a negative effect on CARs which is statistically significant at the 5% level. It implies that serial acquisitions were carried out for the benefit of the managements of the firms involved and not in the interest of the shareholders. DIVPAY has a positive effect on CARs as expected, for a previous good performance is implied when an ability to pay dividends is demonstrated. The result is also statistically significant at the 10% level. CONC has a negative effect on CARs which is statistically significant at the 5% level. This implies that entering the already concentrated market will not result in immediate improved performance for the combined firm, maybe because the concentration is at a level where enhanced performance has to be earned through competition, rather than by collusion among banks or the exercise of market power.

Table 6.26 presents results that show that post-merger cost efficiency for the second year has a negative effect on CARs which is also statistically significant. This outcome is consistent with the result obtained in Chapter Five where cost efficiency of the combined firm was found to have declined in the second year for mergers that took place in 2001, 2002, and 2003. However, the above result is not statistically significant. CONC is negative and statistically significant, and the result may be explained in the same way as it was done for the Table 6.25 result.

In Table 6.27, post-merger efficiency of the combined firm for the third year is predicted to have a positive effect on the CARs. This is an unexpected result if one considers the decline in post-merger cost efficiency for mergers that took place in 2001 and 2002 as reported in Chapter Five. However, there was a gain in post-merger cost efficiency for mergers that took place in 2003. Presumably, the market reacted to this possibility to predict the positive effect. It will be noted, however, that the result is not statistically significant. Both SERIAL and CONC have a negative effect on CARs which is statistically significant. The results may be interpreted the same way as it was done for the Table 6.25 results.

The Table 6.28 results show that post-merger profit efficiency of the combined firm for the first year is predicted to have a positive effect on CARs. This is unexpected if one considers only the 2001 mergers, as profit efficiency declines according to Chapter Five results. However, the market appears to have taken into consideration the fact that profit efficiency improves in the first year for mergers that took place in 2002 and 2003. The results are consistent with both Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006), both of which associate profit efficiency rather than cost efficiency with post-merger performance improvement. It should be noted, however, that the result is not statistically significant. SERIAL has a negative effect while DIVPAY has a positive effect, both of them as expected, and the results are statistically significant at the 5% level and 10% level respectively. The interpretation of these results is like that given for the Table 6.25 results.

Results presented in Table 6.29 show that post-merger profit efficiency of the combined firm for the second year has a positive effect on CARs which is also statistically significant. This is not surprising as, while for the mergers that took place in 2001 profit efficiency declined in the second year, it improved for mergers that were carried out in 2002 and 2003. The result is consistent with the conclusions of both Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006). Both SERIAL and CONC have a negative effect as expected, and both of them statistically significant at the 5% level. The results may be interpreted as done for the Table 6.25 results. RSIZE has a positive effect on CARs, which is not expected, and the result is also statistically significant at the 5% level. Before merger, the size of the target is considered to pose a major

cost challenge in the integration process. However, it has been found that deals involving "equals" can sometimes lead to very successful mergers. At the same time, the size of the target might be a challenge only at the beginning but prove a major benefit after the initial difficulties of integration have been overcome. The positive effect of RSIZE is therefore not necessarily always unexpected.

In Table 6.30 post-merger profit efficiency of the combined firm for the third year is shown to have a positive effect on CARs. This result is not unexpected since, except for the 2001 mergers which led to a decline in profit efficiency in the third year after merger, the 2002 and 2003 mergers resulted in profit efficiency improvements. The result is consistent with both Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006), both of which associate profit efficiency rather than cost efficiency with post-merger performance improvement. It should be noted, however, it is not statistically significant. Once again SERIAL and CONC have negative effects on CARs, both of which are statistically significant at the 5% level, and the results can be interpreted as before.

Three-Year Average Results

Tables 6.31 and 6.32 present results based on the averages of cost efficiency and profit efficiency over the three post-merger years considered. Since the sample being examined is so small, and examining efficiency year by year may be too exacting, analysis using these averages may offer a better depiction of how the market predicts the future performance of merging firms.

In Table 6.31, the average of post-merger cost efficiency is shown to have a negative effect on CARs. This is akin to the market predicting a decline in cost efficiency after merger. The result is predictable on account of the mostly declined cost efficiency in all the years for all the mergers considered in Chapter Five, except for the 2003 mergers whose cost efficiency improved in the third year after merger. CROSS has a positive effect on CARs which is statistically significant at the 10% level, while SERIAL has a negative effect which is statistically significant at the 5% level. CONC also has a negative effect but it is statistically significant at the 10% level.

In Table 6.32, the results show that average post-merger profit efficiency has a positive effect on CARs which is statistically significant. This is akin to the market predicting improvement in profit efficiency after merger. The result is expected as, while for the 2001 mergers profit efficiency did not improve in any of the first three years after merger, it did in all the three years for the mergers that took place in 2002 and 2003, as reported in Chapter Five. The result is consistent with both Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006), both of which associate profit efficiency rather than cost efficiency with post-merger performance improvement. RSIZE has a positive effect on CARs, which is not expected, and it is statistically significant at the 5% level. As pointed out on discussing the Table 6.29 result of the same variable, the size of the target may turn out to be beneficial in the combined firm after overcoming the challenges of integration which typically last only a few years. CROSS has a negative effect on CARs as expected, and is statistically significant at the 10% level. Cross-border mergers pose more integration challenges than domestic mergers as discussed in the earlier part of this analysis that considered pre-merger efficiency. Both SERIAL and CONC have a negative effect on CARs and are both statistically significant at the 5% level.

6.3.2.2 $CAR_{0,+1}$ Regression Results on Post-merger Efficiency

Tables 6.33 to 6.40 present regression results for the CARs for the two-day window combining the merger announcement day and the following day. A brief summary of the results is given under each table, commenting selectively on the efficiency variable, as the focus, and those of the control variables with significant results.

In Table 6.33 post-merger cost efficiency of the combined firm one year after merger, is shown to have a negative effect on CARs. This is predictable on account of the decline in cost efficiency in the first three years after merger for the mergers that took place in 2001, 2002 and 2003, as reported in Chapter Five. However, the result is not statistically significant. CROSS has an unexpected positive effect on CARs which is statistically significant at the 5% level. This implies the market foresees, against theory, that cross-border mergers will perform better post-merger than domestic mergers. It is possible for this to happen where on account of previous experience bidders are not expected to face serious integration challenges after merger, or due to

a good record of top performance pre-merger, the market predicts that trend to continue despite the merger.

According to Table 6.34, post-merger cost efficiency of the combined firm in the second year has a negative effect on CARs. These results are consistent with the results in Chapter Five where it is reported that cost efficiency declines in the second year post-merger for all the mergers that took place in 2001, 2002, and 2003. However, the result is not statistically significant. CROSS has a positive effect on CARs which is statistically significant at the 5% level. The same interpretation offered in discussing the Table 6.33 results applies here. CONC has a positive effect on CARs and statistically significant at the 10% level. This suggests that the combined firm may benefit through collusion with other banks or exercise of market power or through enhanced efficiency emanating from increased competition.

Table 6.35 reports that the post-merger cost efficiency of the combined firm for the third year after merger has a negative effect on CARs. This market's prediction might be based on the decline in cost efficiency reported in Chapter Five for the third year in mergers that took place in 2001 and 2002. Otherwise, there was improvement in third year cost efficiency for the mergers that took place in 2003. Nevertheless, the result is not statistically significant. Both CROSS and CONC have positive effects on CARs which are statistically significant at the 5% level and 10% level respectively.

The results in Table 6.36 show that post-merger profit efficiency of the combined firm for the first year after merger has a positive effect on CARs which is statistically significant. This is predictable on account of the gain in profit efficiency in the first year for the mergers that took place in 2002 and 2003, although for 2001 mergers profit efficiency declined. The result is consistent with both Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006), both of which associate profit efficiency rather than cost efficiency with post-merger performance improvement. CASH has a positive effect on CARs as expected, which is statistically significant at the 5% level. And SERIAL has a negative effect on CARs, as expected, which is also

statistically significant at the 5% level. The results may be interpreted as they were for similar variables when pre-merger efficiency results were discussed above.

The results presented in Table 6.37 show that the post-merger profit efficiency of the combined firm for the second year has a negative effect on CARs. This is not predictable as profit efficiency improved in the second year for both 2002 and 2003 mergers against a decline for only the 2001 mergers. For some reason the market seems to base its prediction on the latter result. The result differs from both Chronopoulos *et al*. (2010) and Aggarwal *et al*. (2006), both of which associate profit efficiency with post-merger performance improvement. There is no ready explanation that can be offered for this outcome. It is to be noted, however, that the result is not statistically significant. CROSS has a positive effect on CARs which is not expected, and the result is statistically significant at the 5% level. SERIAL has the expected negative effect on CARs, and the result is also statistically significant at the 5% level. Finally, CONC has a positive effect on CARs which is statistically significant at the 10% level. These results may be interpreted along the same lines as it was done for similar variables in the foregoing discussions.

Table 6.38 results show that post-merger profit efficiency of the combined firm for the third year after merger has a negative effect on CARs which is statistically significant at the 5% level. This result is not predictable as profit efficiency improved in the third year for both the 2002 and 2003 mergers, while it declined for only the 2001 mergers. Again, the market seems to have preferred to base its prediction on the one-year decline coming earlier after merger, rather than the two-year gain realized later. The result is consistent with neither Chronopoulos *et al*. (2010) nor Aggarwal *et al*. (2006), both of which associate profit efficiency with post-merger performance improvement. There is no explanation based on theory that can be offered for this outcome. CROSS has a positive effect on CARs which is statistically significant at the 5% level, and the result may be interpreted as it was done in the preceding paragraphs.

Three-Year Average Results

Tables 6.39 and 6.40 present results based on the averages of cost efficiency and profit efficiency over the three post-merger years considered. Since the sample being examined is so small,

analysis using these averages may offer a better depiction of how the market predicts the future performance of merging firms.

In Table 6.39, the results report that the three-year average of post-merger cost efficiency of the combined firm has a negative effect on CARs. This is a predictable result if the yearly results reported in Chapter Five are considered. In those results, cost efficiency is shown to decline in all the three post-merger years for mergers that took place in 2001 and 2002. Cost efficiency also declines in the first two years following merger for the mergers that occurred in 2003, improving only in the third year. It is to be noted, however, that the results are not statistically significant. Both CROSS and CONC have a positive effect on CARs which is statistically significant at the 5% level and 10% level respectively. The results may be interpreted as done previously in the above discussions.

In Table 6.40, the three-year average of the post-merger profit efficiency of the combined firm is shown to have a negative effect on CARs. This result is unpredictable because, whereas profit efficiency declines for all the three post-merger years for mergers that took place in 2001 as reported in Chapter Five, it improves in all the three years for the mergers that took place in 2002 and 2003. For some reason, the market seems to base its prediction on the performance of the 2001 mergers alone. It is to be noted that the result is also statistically significant at the 5% level. The result is consistent with neither Chronopoulos *et al*. (2010) nor Aggarwal *et al*. (2006), both of which associate profit efficiency with post-merger performance improvement. There is no ready explanation that can be offered for this outcome. CROSS has a positive effect on CARs which is also statistically significant at the 5% level, and the result may be interpreted as in previous discussions.

6.3.2.3 Summary of Results

To get an overall picture of the above results, they are summarized in Table 6.41 below. Comments on the summary dwell mainly on the efficiency variable.

Table 6.41 Summary of Significant Results for Efficiency and Control Variables – Main Post-merger Analysis

Variables	Frequency of Significant Result			
	$CAR_{-1, 0}$		$CAR_{0, +1}$	
	5% Level	10% Level	5% Level	10% Level
POSTCOS1EFF	0	0	0	0
POSTCOS2EFF	0	0	0	0
POSTCOS3EFF	0	0	0	0
POSTPFT1EFF	0	0	**1(+)**	0
POSTPFT2EFF	**1(+)**	0	0	0
POSPFT3EFF	0	0	**1(-)**	0
POSTCOSAVGEFF	**1(-)**	0	0	0
POSTPFTAVGEFF	**1(+)**	0	**1(-)**	0
SUB-TOTAL	**3**	**0**	**3**	**0**
RSIZE	**2(+)**	0	0	0
CROSS	**1(+)**	**2(+1, -1)**	**7(+)**	0
CASH	0	0	**1(+)**	0
SERIAL	**7(-)**	0	**2(-)**	0
DIVPAY	0	**2(+)**	0	0
CONC	**5(-)**	**1(-)**	**1(+)**	**3(+)**
SUB-TOTAL	**15**	**5**	**11**	**3**
F-STATISTIC	0	0	0	**1**
TOTAL	**18**	**5**	**14**	**4**

Note: As before, the above variables are defined as: POSTCOS1EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the first year; POSTCOS2EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the second year; POSTCOS3EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the third year; POSTPFT1EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the first year; POSTPFT2EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the second year; POSTPFT3EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the third year; POSTCOSAVGEFF = average cost efficiency for the three years after merger; POSTPFTAVGEFF = average profit efficiency for the three years after merger; RSIZE = relative size of target to bidder in total assets; CROSS = 1 when merger is cross-border and 0 when it is domestic; CASH = 1 when deal payment is made in cash and 0 when it is stock or combination of cash and stock; SERIAL = 1 when a bidder has been involved in another acquisition in the past three years and 0 otherwise; DIVPAY = dividend payout ratio

calculated as dividend divided by net income; CONC = concentration calculated as assets of the three largest banks in a market divided by total assets of all banks in that market.

$CAR_{-1, 0}$ Results

The results presented in Table 6.41 show that the market's perception of future profit efficiency influences its reaction to merger announcement more than its discernment of future cost efficiency. Second year profit efficiency is statistically significant at the 5% level, as well as average profit efficiency over the three years after merger, and both of them have a positive effect on CARs.

Ignoring their effect on CARs, whether positive or negative, all the control variables, except cash, are statistically significant at either 5% or 10% or both, indicating the market's recognition of their impact on post-merger performance. The SERIAL variable makes the most contribution to the market's perception of future performance, presumably acknowledging the serial acquirer's ability to use previous acquisition experience to ensure that post-merger goals are attained. The market makes a similar evaluation of the CONC variable's importance, perhaps with an awareness of how bank concentration in the target's market can be exploited by the combined bank to achieve the desired post-merger performance. The other variables with significant results are CROSS (at 5% and 10%), RSIZE (at 5% and 10%), and DIVPAY (at 10%).

$CAR_{0, +1}$ Results

From Table 6.41 it can be seen again that profit efficiency overshadows cost efficiency in the market's perception of the effect of future performance on value creation through CARs at the time of merger announcement. First year profit efficiency, with a positive effect on CARs, is statistically significant at the 5% level. Third year and three-year average efficiencies with a negative effect on CARs are also similarly statistically significant.

As for control variables, ignoring effect on CARs, whether positive or not, CROSS is the dominant variable, with seven out of eight results significant at the 5% level. Other variables with significant results are SERIAL (at 5%), CONC (at 5% and 10%) and CASH (at 5%).

6.3.2.4 Additional Analysis on Post-merger Efficiency

For comparison purposes, an analysis of post-merger efficiency using only the control variables used by Kohers *et al*. (2000) was also performed, and the results are presented in Tables 6.63 to 6.78 of Appendix 2. The results may be interpreted the same way as done earlier. A summary appears below as Table 6.42, followed by brief comments.

Table 6.42 Summary of Significant Results for Efficiency and Control Variables – Additional Post-merger Analysis

Variables	Frequency of Significant Result			
	CAR-1, 0		$CAR_{0, +1}$	
	5% Level	10% Level	5% Level	10% Level
POSTCOS1EFF	0	0	0	0
POSTCOS2EFF	**1(-)**	0	0	0
POSTCOS3EFF	0	0	0	0
POSTPFT1EFF	**1(-)**	0	0	0
POSTPFT2EFF	**1(+)**	0	0	0
POSPFT3EFF	0	0	**1(-)**	0
POSTCOSAVGEFF	**1(-)**	0	0	0
POSTPFTAVGEFF	0	0	**1(-)**	0
SUB-TOTAL	**4**	**0**	**2**	**0**
RSIZE	**1(+)**	0	**1(+)**	**2(+)**
CROSS	**1(+)**	**2(+)**	**5(+)**	**2(+)**
CASH	**5(-)**	0	0	**1(-)**
SUB-TOTAL	**7**	**2**	**6**	**5**
F-STATISTIC	0	0	**1**	**1**
TOTAL	**11**	**2**	**9**	**6**

Note: As before, the above variables are defined as: POSTCOS1EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the first year; POSTCOS2EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the second year; POSTCOS3EFF = difference between pre-merger cost efficiency and post-merger cost efficiency for the third year; POSTPFT1EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the first year; POSTPFT2EFF = difference between pre-merger profit

efficiency and post-merger profit efficiency for the second year; POSTPFT3EFF = difference between pre-merger profit efficiency and post-merger profit efficiency for the third year; POSTCOSAVGEFF = average cost efficiency for the three years after merger; POSTPFTAVGEFF = average profit efficiency for the three years after merger; RSIZE = relative size of target to bidder in total assets; CROSS = 1 when merger is cross-border and 0 when it is domestic; CASH = 1 when deal payment is made in cash and 0 when it is stock or combination of cash and stock; SERIAL = 1 when a bidder has been involved in another acquisition in the past three years and 0 otherwise; DIVPAY = dividend payout ratio calculated as dividend divided by net income; CONC = concentration calculated as assets of the three largest banks in a market divided by total assets of all banks in that market.

$CAR_{-1, 0}$ Results

In Table 6.42, the results show that the market perceives profit efficiency more positively than it does cost efficiency. Profit efficiency for the second year after merger has a positive significant effect on CARs, once again showing that profit efficiency is distinguishable from cost efficiency. However, profit efficiency has a negative influence on CARs for the first year, cost efficiency has a negative influence on CARS for the second year, and the three-year average cost efficiency also has a negative effect on CARs.

There is at least one significant result at the 5% level for each control variable, with CASH having the most significant results, followed by CROSS, two of whose results are at 10%.

$CAR_{0, +1}$ Results

Once again profit efficiency overshadows cost efficiency by producing two significant results although both of them have a negative effect on CARs. Profit efficiency in the third year and the average of three years are both positive and statistically significant at the 5% level.

Both RSIZE and CROSS produce several significant results at both the 5% level and the 10% level, while CASH yields only one result, at the 10% level.

6.4 Discussion and Conclusions

In Chapter Three, this study investigated the reaction of the market to merger announcements made with respect to bank mergers that took place in Europe between 2001 and 2007. Cumulative abnormal returns (CARs) were analyzed for the bidding banks and reported for various windows within the event period. In Chapter Five, pre-merger cost and profit efficiencies

of both bidding and target banks were estimated. Post-merger efficiencies were also estimated for the combined firm. In this chapter, the aim was to examine whether bank efficiency is taken into account by the market in evaluating a proposed merger, which it does by adjusting the involved banks' stock prices on merger announcement.

Positive CARs that result from a merger announcement constitute value creation for the shareholders of the merging banks. On the other hand, negative CARs are value-destroying. This information is an early indication of mergers that can be expected to improve performance post-merger and those that may not, at least in the foreseeable future. It is important information for the shareholders, as well as for other stakeholders, including policy makers. If upon announcement a merger is perceived as value-destroying by the market and key stakeholders, it might end up not taking place. The primary purpose of the investigation carried out in this chapter therefore, was to find out whether pre-merger bank efficiency has a contribution in value creation at the time of merger announcement. At the same time, since to the market past bank performance is important for evaluating the bank's likely future overall performance, the market's current valuation may also be used as an indication of future performance. In other words, if bank efficiency, for example, has a positive effect on CARs it is an indication that the market foresees improved efficiency post-merger. If this is stretched further, it means that the market may be reacting to future bank efficiency while responding simultaneously to past efficiency. This analogy is consistent with the suggestion by the semi-strong form of the Efficient Market Hypothesis that in an efficient market a stock price is determined from all information including information not necessarily already available to the public but which can be instantaneously absorbed into the price once it is perceived by market participants. Due to these reasons, future bank efficiency results obtained in Chapter Five are also investigated in this chapter to determine their effect on CARs.

The main finding of the investigation is that pre-merger target cost efficiency has an important influence on how the market reacts to merger announcement and therefore on value creation for the bidders' shareholders. This is demonstrated by significant results that are obtained when CARs are regressed on the difference between peer cost efficiency and target cost efficiency, and

when regressed on the difference between peer cost efficiency and the average of bidder cost efficiency plus target cost efficiency. Even with the analysis performed using $CAR_{0, +1}$, which was carried out for comparison purposes, target cost efficiency demonstrates its importance by producing a significant result when its difference with peer cost efficiency is used in the regression. Bidder profit efficiency is also important as it yields a significant result when included in the regression alone or as a difference between it and target profit efficiency.

What the results obtained in the analysis performed in this chapter suggest is that CARs are affected positively by the difference between target efficiency and either bidder or peer efficiency. These results are consistent with theory in that the potential for post-merger performance improvement lies in there being a difference in the efficiencies of the bidder and target or peers and the target. That potential exists also where the average of bidder efficiency plus target efficiency is less than peer efficiency. However, where target efficiency is too low compared to that of bidder or peers, the study finds that the market reacts negatively to merger announcement. Presumably, the market perceives a merger where that is the case as unlikely to lead to post-merger improvements for a while due to the difficulty of raising a very low target efficiency to bidder or peer level.

The findings of this study are largely supportive of both theories of the Inefficient Market Hypothesis. As Kohers *et al*. (2000) point out, the first theory, the Relative Efficiency Hypothesis, suggests that where an efficient firm takes over a less efficient institution, the bidder may carry out efficiency-enhancing changes that can raise the efficiency of that part of the new firm that was originally the target. The second theory, the Low Efficiency Hypothesis, applies where the target's efficiency is less than that of its peers, or both the target's and bidder's efficiencies are less than those of their peers. Theory suggests that in either case, potential for ex-post improvements exist, and that the larger the difference in efficiency the greater the post-event improvements that can be expected (Berger *et al.,* 1999). In the results reported above, all efficiency difference variables have a positive effect on CARs, some of them statistically significant, except for those involving target profit efficiency. As already pointed out, target profit efficiency was so low that the market might have considered it unlikely that desired

improvements would be realized in the desired time after merger; hence the negative effect on CARs.

Post-merger results reported in Chapter Five show that there is greater profit efficiency improvement than cost efficiency in the first three years after merger. This was to be expected since target profit efficiency having been so low pre-merger it offered the greatest potential for improvement, despite the market's skepticism as suggested in the preceding paragraph. It is to be noted, however, that the improvement was from a low figure of the combined firm to a higher low figure, without comparison with peers whose profit efficiency remained higher in that period. In the analysis of post-merger performance examined in this chapter, the market seems to react more and positively to profit efficiency than to cost efficiency. Also, from the negative effect of SERIAL on CARs, the market seems to perceive serial acquirers as engaging in mergers in the interest of the management and not that of shareholders.

To a good extent, the results obtained in this study are consistent with the findings of the two studies that have done a similar investigation using US data. As mentioned earlier, this is the first study that uses European data that has examined the effect of bank efficiency on cumulative abnormal returns in more or less the same manner as the US studies.

Two main conclusions can be drawn from the above discussion. First of all, pre-merger bank efficiency has a positive influence on wealth creation for the bidders experienced on merger announcement. The influence is associated more with the difference between target efficiency and bidder efficiency, target efficiency and peer efficiency, and that of peer efficiency and the average of bidder efficiency plus target efficiency. That bank efficiency should impact on shareholder wealth creation establishes efficiency as a performance measure to be taken seriously into account in evaluating all institutions alongside the more traditional measures. Secondly, and more importantly, evidence is found that as the market reacts to a merger announcement, it simultaneously predicts post-merger profit efficiency performance, but there is no such evidence for cost efficiency.

In the next chapter, the findings of this study will be summarized and the research concluded.

6.5 Appendix 6.1 Analysis of Pre-merger Efficiency (All Variables)

Table 6.3 Regression Results for CAR on Pre-merger Bidder Cost Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.4660	2.3728	-0.1964	0.8454
BIDCOSEFF	0.0191	0.0222	0.8587	0.3964
RSIZE	0.1650	0.3306	0.4992	0.6207
CROSS	-0.6500	0.2403	-2.7053	0.0105*
CASH	0.4207	0.2351	1.7892	0.0822**
SERIAL	-0.8273	0.4882	-1.6945	0.0991**
DIVPAY	0.0117	0.0059	1.9643	0.0575**
CONC	-0.0326	1.1709	-0.0279	0.9779
R-squared	0.4331	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1092	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0899	Durbin- Watson Statistic		2.5357
F-statistic	1.3370	Prob. (F-statistic)		0.2205

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.4 Regression Results for CAR on Pre-merger Bidder Profit Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.7586	0.8326	0.9111	0.3685
BIDPFTEFF	0.0129	0.0041	3.1510	0.0033*
RSIZE	0.0409	0.3719	0.1101	0.9130
CROSS	-0.6341	0.2475	-2.5623	0.0149*
CASH	0.4111	0.2207	1.8624	0.0709**
SERIAL	-0.9536	0.6467	-1.4747	0.1492
DIVPAY	0.0105	0.0055	1.9080	0.0646**
CONC	-0.8172	0.7659	-1.0670	0.2933
R-squared	0.4202	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0889	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1023	Durbin- Watson Statistic		2.7147
F-statistic	1.2684	Prob. (F-statistic)		0.2624

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.5 Regression Results for CAR on Pre-merger Bidder-Target Cost Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.2898	0.8184	1.5761	0.1240
BIDTGTCOSEFF	0.0224	0.0152	1.4697	0.1506
RSIZE	0.1729	0.4147	0.4169	0.6793
CROSS	-0.5311	0.2345	-2.2646	0.0298*
CASH	0.4477	0.1875	2.3979	0.0225*
SERIAL	-0.8643	0.6751	-1.2802	0.2089
DIVPAY	0.0089	0.0050	1.7753	0.0845**
CONC	-0.5758	0.9116	-0.6316	0.5317
R-squared	0.4424	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1238	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0810	Durbin- Watson Statistic		2.5253
F-statistic	1.3884	Prob. (F-statistic)		0.1930

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.6 Regression Results for CAR on Pre-merger Bidder-Target Profit Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.1987	0.7554	1.5867	0.1216
BIDTGTPFTEFF	0.0149	0.0075	1.9987	0.0535**
RSIZE	0.0329	0.3832	0.0859	0.9320
CROSS	-0.6429	0.2751	-2.3372	0.0253*
CASH	0.3830	0.2159	1.7740	0.0848**
SERIAL	-0.9302	0.6357	-1.4633	0.1523
DIVPAY	0.0121	0.0057	2.1036	0.0427*
CONC	-0.5477	0.7812	0.7011	0.4879
R-squared	0.4289	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1026	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0939	Durbin- Watson Statistic		2.7666
F-statistic	1.3145	Prob. (F-statistic)		0.2336

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.7 Regression Results for CAR on Pre-merger Target Cost Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	4.6025	1.1632	3.9568	0.0004*
TGTCOSEFF	-0.0437	0.0133	-3.2717	0.0024*
RSIZE	0.0941	0.3633	0.2589	0.7972
CROSS	-0.4990	0.2117	-2.3569	0.0241*
CASH	0.3609	0.1618	2.2308	0.0322*
SERIAL	-0.8291	0.6741	-1.2300	0.2269
DIVPAY	0.0081	0.0046	1.7499	0.0889**
CONC	-0.8470	0.9623	-.8802	0.3848
R-squared	0.4593	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1504	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0645	Durbin- Watson Statistic		2.5783
F-statistic	1.4868	Prob. (F-statistic)		0.1486

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.8 Regression Results for CAR on Pre-merger Target Profit Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.1610	0.4529	2.5631	0.0148*
TGTPFTEFF	0.0073	0.0173	0.4216	0.6759
RSIZE	0.0705	0.3567	0.1977	0.8444
CROSS	-0.5355	0.2194	-2.4402	0.0199*
CASH	0.4070	0.1851	2.1989	0.0346*
SERIAL	-0.8739	0.6892	-1.2679	0.2132
DIVPAY	0.0078	0.0059	1.3365	0.1900
CONC	-0.8771	1.2559	-0.6983	0.4896
R-squared	0.4143	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0796	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1079	Durbin- Watson Statistic		2.6419
F-statistic	1.2377	Prob. (F-statistic)		0.2830

Note: *Significant at the 5% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.9 Regression Results for CAR on Pre-merger Peer-Target Cost Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.3821	0.7624	1.8128	0.0784**
PRTGTCOSEFF	0.0476	0.0097	4.9250	0.0000*
RSIZE	0.0526	0.3693	0.1424	0.8875
CROSS	-0.3917	0.2330	-1.6811	0.1016
CASH	0.3651	0.1519	2.4026	0.0217*
SERIAL	-0.8388	0.6821	-1.2298	0.2270
DIVPAY	0.0072	0.0049	1.4688	0.1508
CONC	-0.8301	0.8997	-0.9226	0.3625
R-squared	0.4710	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1688	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0529	Durbin- Watson Statistic		2.5509
F-statistic	1.5584	Prob. (F-statistic)		0.1224

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.10 Regression Results for CAR on Pre-merger Peer-Target Profit Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.8364	1.0290	1.7846	0.0830**
PRTGTPFTEFF	-0.0108	0.0107	-1.0114	0.3188
RSIZE	0.1561	0.3854	0.4051	0.6878
CROSS	-0.6639	0.2719	-2.4420	0.0198*
CASH	0.4204	0.1858	2.2623	0.0300*
SERIAL	-0.9361	0.6497	-1.4407	0.1586
DIVPAY	0.0068	0.0064	1.0589	0.2969
CONC	-0.7208	0.7492	-0.9620	0.3426
R-squared	0.4309	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1056	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0921	Durbin- Watson Statistic		2.5615
F-statistic	1.3248	Prob. (F-statistic)		0.2275

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.11 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Cost Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.4977	0.7132	2.0998	0.0430*
PRBDTGTCOSEFF	0.0520	0.0203	2.5574	0.0150*
RSIZE	-0.0219	0.3332	-0.0659	0.9478
CROSS	-0.3395	0.2881	-1.1784	0.2466
CASH	0.4173	0.1695	2.4620	0.0189*
SERIAL	-0.8403	0.6933	-1.2120	0.2336
DIVPAY	0.0055	0.0051	1.0767	0.2890
CONC	-1.0049	0.8022	-1.2526	0.2186
R-squared	0.4535	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1413	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0702	Durbin- Watson Statistic		2.6195
F-statistic	1.4523	Prob. (F-statistic)		0.1630

Note: *Significant at the 5% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.12 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Profit Efficiency ($CAR_{-1, 0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.7384	0.9281	1.8731	0.0694**
PRBDTGTPFTEFF	-0.0109	0.0108	-1.0102	0.3193
RSIZE	0.1543	0.3801	0.4061	0.6872
CROSS	-0.6826	0.3049	-2.2388	0.0316*
CASH	-0.4059	0.1798	2.2569	0.0304*
SERIAL	-0.9368	0.6532	-1.4343	0.1604
DIVPAY	0.0079	0.0053	1.4801	0.1478
CONC	-0.6481	0.6899	-0.9395	0.3539
R-squared	0.4299	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1041	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0930	Durbin- Watson Statistic		2.5942
F-statistic	1.3197	Prob. (F-statistic)		0.2305

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.13 Regression Results for CAR on Pre-merger Bidder Cost Efficiency ($CAR_{0, +1}$)(N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.7020	2.4654	0.6904	0.4945
BIDCOSEFF	-0.0209	0.0229	-0.9132	0.3673
RSIZE	-0.5208	0.4764	-1.0933	0.2817
CROSS	0.5015	0.9300	0.5392	0.5931
CASH	0.6247	0.1589	3.9318	0.0004*
SERIAL	-0.7124	0.5106	-1.3951	0.1718
DIVPAY	0.0051	0.0055	0.9316	0.3579
CONC	-0.1769	2.0918	-0.0846	0.9331
R-squared	0.4108	Mean of Dependent Variable		0.5758
Adj. R-squared	0.0741	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.6958	Durbin- Watson Statistic		2.5372
F-statistic	1.2201	Prob. (F-statistic)		0.2954

Note: *Significant at the 5% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.14 Regression Results for CAR on Pre-merger Bidder Profit Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-2.1910	1.6121	-1.3591	0.1828
BIDPFTEFF	0.0286	0.0201	1.4229	0.1636
RSIZE	0.1620	0.4055	0.3997	0.6918
CROSS	0.7485	0.7076	1.0579	0.2973
CASH	0.8784	0.3217	2.7103	0.0098*
SERIAL	-1.0116	0.5816	-1.7393	0.0908**
DIVPAY	0.0126	0.0106	1.1958	0.2398
CONC	0.1775	1.1497	0.1544	0.8782
R-squared	0.4994	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2133	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5631	Durbin- Watson Statistic		2.5619
F-statistic	1.7456	Prob. (F-statistic)		0.0728**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.15 Regression Results for CAR on Pre-merger Bidder-Target Cost Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.8448	0.9717	-0.8694	0.3905
BIDTGTCOSEFF	0.0176	0.0289	0.6088	0.5466
RSIZE	0.3054	0.5078	0.6014	0.5515
CROSS	0.9353	0.6550	1.4279	0.1622
CASH	0.9192	0.3884	2.3665	0.0236*
SERIAL	-0.8005	0.4825	-1.6589	0.1061
DIVPAY	0.0083	0.0069	1.1864	0.2435
CONC	0.5301	1.3309	0.3983	0.6928
R-squared	0.4913	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2007	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5756	Durbin- Watson Statistic		2.5992
F-statistic	1.6903	Prob. (F-statistic)		0.0849**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.16 Regression Results for CAR on Pre-merger Bidder-Target Profit Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.9017	1.0741	-0.8394	0.4069
BIDTGTPFTEFF	0.0107	0.0176	0.6096	0.5460
RSIZE	0.1976	0.4172	0.4737	0.6387
CROSS	0.8530	0.6929	1.2310	0.2265
CASH	0.8708	0.3609	2.4122	0.0212*
SERIAL	-0.8471	0.5313	-1.5942	0.1199
DIVPAY	0.0105	0.0109	0.9656	0.3409
CONC	0.5416	1.2491	0.4336	0.6673
R-squared	0.4870	Mean of Dependent Variable		0.5758
Adj. R-squared	0.1939	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5823	Durbin- Watson Statistic		2.5576
F-statistic	1.6614	Prob. (F-statistic)		0.0921**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.17 Regression Results for CAR on Pre-merger Target Cost Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	2.4516	2.2654	1.0822	0.2866
TGTCOSEFF	-0.0438	0.0345	-1.2713	0.2120
RSIZE	0.2487	0.4242	0.5863	0.5614
CROSS	0.9736	0.6863	1.4186	0.1649
CASH	0.8382	0.3472	2.4144	0.0211*
SERIAL	-0.7674	0.4999	-1.5349	0.1338
DIVPAY	0.0076	0.0058	1.2984	0.2026
CONC	0.2853	1.2158	0.2346	0.8159
R-squared	0.5036	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2199	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5565	Durbin- Watson Statistic		2.4769
F-statistic	1.7755	Prob. (F-statistic)		0.0669**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.18 Regression Results for CAR on Pre-merger Target Profit Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-1.5220	0.9102	-1.6723	0.1034
TGTPFTEFF	0.0223	0.0260	0.8546	0.3986
RSIZE	0.2286	0.3574	0.6396	0.5266
CROSS	0.9856	0.7001	1.4078	0.1680
CASH	0.8587	0.3759	2.2842	0.0285*
SERIAL	-0.8532	0.5095	-1.6744	0.1030
DIVPAY	0.0062	0.0068	0.9139	0.3670
CONC	-0.1029	1.6618	-0.0619	0.9509
R-squared	0.4903	Mean of Dependent Variable		0.5758
Adj. R-squared	0.1991	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5771	Durbin- Watson Statistic		2.4861
F-statistic	1.6837	Prob. (F-statistic)		0.0865**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.19 Regression Results for CAR on Pre-merger Peer-Target Cost Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.7751	0.9358	-0.8283	0.4131
PRTGTCOSEFF	0.0417	0.0383	1.0889	0.2836
RSIZE	0.2092	0.4076	0.5132	0.6111
CROSS	1.0599	0.7459	1.4209	0.1642
CASH	0.8493	0.3525	2.4092	0.0214*
SERIAL	-0.7791	0.5005	-1.5565	0.1286
DIVPAY	0.0069	0.0056	1.2201	0.2306
CONC	0.3185	1.2085	0.2636	0.7937
R-squared	0.5027	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2185	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5579	Durbin- Watson Statistic		2.4804
F-statistic	1.7688	Prob. (F-statistic)		0.0682**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.20 Regression Results for CAR on Pre-merger Peer-Target Profit Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.2727	1.0379	-0.2628	0.7943
PRTGTPFTEFF	-0.0122	0.0185	-0.6584	0.5146
RSIZE	0.3216	0.4051	0.7937	0.4327
CROSS	0.7956	0.6495	1.2248	0.2288
CASH	0.8979	0.3401	2.6401	0.0123*
SERIAL	-0.8846	0.6399	-1.3825	0.1756
DIVPAY	0.0061	0.0057	1.0724	0.2909
CONC	0.4097	1.1732	0.3492	0.7290
R-squared	0.4933	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2038	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5725	Durbin- Watson Statistic		2.4919
F-statistic	1.7038	Prob. (F-statistic)		0.0818**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.21 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Cost Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.7228	0.8609	-0.8396	0.4068
PRBDTGTCOSEFF	0.0146	0.0423	0.3456	0.7317
RSIZE	0.1979	0.3614	0.5476	0.5874
CROSS	0.9749	0.7966	1.2239	0.2292
CASH	0.8964	0.3649	2.4567	0.0191*
SERIAL	-0.7885	0.4888	-1.6129	0.1157
DIVPAY	0.0071	0.0050	1.4039	0.1692
CONC	0.3454	1.0811	0.3195	0.7512
R-squared	0.4848	Mean of Dependent Variable		0.5758
Adj. R-squared	0.1903	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5857	Durbin- Watson Statistic		2.5449
F-statistic	1.6465	Prob. (F-statistic)		0.0959**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

Table 6.22 Regression Results for CAR on Pre-merger Peer-(Bidder + Target)1/2 Profit Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.2872	0.9281	-0.3094	0.7588
PRBDTGTPFTEFF	-0.0155	0.0221	-0.7006	0.4882
RSIZE	0.3448	0.4441	0.7766	0.4426
CROSS	0.7379	0.6389	1.5448	0.2560
CASH	0.8776	0.3357	2.6146	0.0131*
SERIAL	-0.9100	0.6591	-1.3806	0.1762
DIVPAY	0.0072	0.0062	1.1655	0.2517
CONC	0.5074	1.2062	0.4207	0.6766
R-squared	0.4984	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2118	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5646	Durbin- Watson Statistic		2.4859
F-statistic	1.7391	Prob. (F-statistic)		0.0741**

Note: *Significant at the 5% level. **Significant at the 10% level. Variables are as defined in Tables 6.1 and 6.2.

6.6 Appendix 6.2 Analysis of Post-merger Efficiency (All Variables)

Table 6.25 Regression Results for CAR on Post-merger Cost Efficiency Year One ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	5.1416	1.8274	2.8137	0.0374*
POSTCOS1EFF	0.2664	5.4046	0.0493	0.9626
RSIZE	1.2048	0.9921	1.2144	0.2788
CROSS	0.1626	0.0623	2.6113	0.0476*
CASH	-0.3399	0.5423	-0.6267	0.5583
SERIAL	-2.3363	0.5895	-3.9631	0.0107*
DIVPAY	0.0097	0.0048	2.0196	0.0994**
CONC	-5.3242	1.9373	-2.7483	0.0404*
R-squared	0.7525	Mean of Dependent Variable		1.1119
Adj. R-squared	0.0593	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2875	Durbin- Watson Statistic		3.3063
F-statistic	1.0856	Prob. (F-statistic)		0.5042

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.26 Regression Results for CAR on Post-merger Cost Efficiency Year Two ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	3.0703	3.1699	0.9686	0.3772
POSTCOS2EFF	-10.4550	6.5259	-1.6021	0.1700
RSIZE	0.3374	0.6201	0.5442	0.6097
CROSS	0.4769	0.3591	1.3281	0.2415
CASH	-1.0048	1.0606	-0.9474	0.3869
SERIAL	-1.3786	0.9019	-1.5284	0.1870
DIVPAY	0.0058	0.0053	1.1069	0.3187
CONC	-2.2485	3.6820	-0.6107	0.0581**
R-squared	0.7863	Mean of Dependent Variable		1.1119
Adj. R-squared	0.1881	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.1961	Durbin- Watson Statistic		3.6522
F-statistic	1.3145	Prob. (F-statistic)		0.4073

Note: **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.27 Regression Results for CAR on Post-merger Cost Efficiency Year Three ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	5.4733	1.9870	2.7545	0.0401*
POSTCOS3EFF	1.3409	1.5417	0.8697	0.4242
RSIZE	1.3413	0.8751	1.5327	0.1859
CROSS	0.0801	0.0886	0.9040	0.4074
CASH	-0.2381	0.7978	-0.2985	0.7773
SERIAL	-2.4780	0.6573	-3.7702	0.0130*
DIVPAY	0.0095	0.0068	1.3932	0.2223
CONC	-5.7011	2.1994	-2.5921	0.0487*
R-squared	0.7532	Mean of Dependent Variable		1.1119
Adj. R-squared	0.0623	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2854	Durbin- Watson Statistic		3.3109
F-statistic	1.0901	Prob. (F-statistic)		0.5021

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.28 Regression Results for CAR on Post-merger Profit Efficiency Year One ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	4.9893	2.1142	2.3599	0.0648**
POSTPFT1EFF	2.6480	3.7029	0.7151	0.5065
RSIZE	0.8955	0.9265	0.9665	0.3782
CROSS	-0.4383	0.9251	-0.4738	0.6556
CASH	0.1987	0.8907	0.2231	0.8323
SERIAL	-2.6677	0.6081	-4.3871	0.0071*
DIVPAY	0.0134	0.0066	2.0315	0.0979**
CONC	-5.1298	2.5614	-2.0027	0.1016
R-squared	0.7596	Mean of Dependent Variable		1.1119
Adj. R-squared	0.0864	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2688	Durbin- Watson Statistic		3.2559
F-statistic	1.1283	Prob. (F-statistic)		0.4843

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.29 Regression Results for CAR on Post- merger Profit Efficiency Year Two ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	5.1444	1.2922	3.9813	0.0105*
POSTPFT2EFF	11.2556	3.9975	2.8156	0.0373*
RSIZE	3.5743	0.8594	4.1589	0.0088*
CROSS	0.1196	0.2245	0.5329	0.6169
CASH	0.3794	0.5421	0.6998	0.5153
SERIAL	-2.1229	0.4866	-4.3627	0.0073*
DIVPAY	0.0001	0.0097	0.0112	0.9915
CONC	-6.0882	1.0786	-5.6446	0.0024*
R-squared	0.8424	Mean of Dependent Variable		1.1119
Adj. R-squared	0.4010	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.0273	Durbin- Watson Statistic		3.6160
F-statistic	1.9089	Prob. (F-statistic)		0.2455

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.30 Regression Results for CAR on Post-merger Profit Efficiency Year Three ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	4.8367	1.1188	4.3231	0.0075*
POSTPFT3EFF	4.2704	3.4222	1.2479	0.2673
RSIZE	1.3379	0.7978	1.6769	0.1544
CROSS	-0.0256	0.1686	-0.1516	0.8855
CASH	0.0898	0.9532	0.0942	0.9286
SERIAL	-2.3557	0.3549	-6.6375	0.0012*
DIVPAY	0.0064	0.0099	0.6402	0.5502
CONC	-4.8658	0.7622	-6.3835	0.0014*
R-squared	0.7841	Mean of Dependent Variable		1.1119
Adj. R-squared	0.1795	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2024	Durbin- Watson Statistic		3.3203
F-statistic	1.2969	Prob. (F-statistic)		0.4139

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.31 Regression Results for CAR on Average Post-merger Cost Efficiency ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	4.5099	2.1797	2.0691	0.0934**
POSTCOSAVGEFF	-3.8679	0.7754	-4.9882	0.0041*
RSIZE	0.8779	0.6217	1.4122	0.2170
CROSS	0.2919	0.1403	2.0804	0.0920**
CASH	-0.6137	0.7886	-0.7781	0.4717
SERIAL	-2.0815	0.5796	-3.5913	0.0157*
DIVPAY	0.0102	0.0078	1.3014	0.2498
CONC	-4.5215	2.2229	-2.0341	0.0976**
R-squared	0.7558	Mean of Dependent Variable		1.1119
Adj. R-squared	0.0721	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2787	Durbin- Watson Statistic		3.3151
F-statistic	1.1055	Prob. (F-statistic)		0.4948

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.32 Regression Results for CAR on Average Post-merger Profit Efficiency ($CAR_{-1, 0}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	4.4904	0.3935	11.4114	0.0001*
POSTPFTAVGEFF	15.7184	6.2236	2.5256	0.0528**
RSIZE	1.8945	0.4867	3.8923	0.0115*
CROSS	-1.2817	0.5787	-2.2148	0.0776**
CASH	1.6253	1.2839	1.2659	0.2613
SERIAL	-2.9167	0.4583	-6.3642	0.0014*
DIVPAY	0.0083	0.0065	1.2696	0.2601
CONC	-4.7573	0.1932	-24.6188	0.0000*
R-squared	0.8472	Mean of Dependent Variable		1.1119
Adj. R-squared	0.4194	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.0115	Durbin- Watson Statistic		3.0627
F-statistic	1.9804	Prob. (F-statistic)		0.2321

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.33 Regression Results for CAR on Post-merger Cost Efficiency Year One ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-4.6922	3.3299	-1.4091	0.2178
POSTCOS1EFF	-20.6559	28.4722	-0.7255	0.5007
RSIZE	0.1438	2.9339	0.0490	0.9628
CROSS	1.6636	0.3530	4.7126	0.0053*
CASH	0.9854	1.6894	0.5833	0.5850
SERIAL	-1.3769	1.2241	-1.1249	0.3117
DIVPAY	0.0022	0.0352	0.0635	0.9518
CONC	7.4389	6.0675	1.2260	0.2748
R-squared	0.7713	Mean of Dependent Variable		1.1602
Adj. R-squared	0.1308	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1063	Durbin- Watson Statistic		2.8404
F-statistic	1.2042	Prob. (F-statistic)		0.4509

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.34 Regression Results for CAR on Post-merger Cost Efficiency Year Two ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-7.9835	1.4117	-5.6554	0.0024*
POSTCOS2EFF	-20.0609	18.5658	-1.0805	0.3292
RSIZE	-0.4673	2.4514	-0.1906	0.8563
CROSS	2.1339	0.7507	2.8426	0.0361*
CASH	0.8269	1.1613	0.7120	0.5083
SERIAL	0.4555	1.4472	0.3148	0.7656
DIVPAY	-0.0143	0.0156	-0.9164	0.4015
CONC	12.6151	1.5363	8.2112	0.0004*
R-squared	0.7906	Mean of Dependent Variable		1.1602
Adj. R-squared	0.2043	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.0153	Durbin- Watson Statistic		2.5127
F-statistic	1.3484	Prob. (F-statistic)		0.3949

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.35 Regression Results for CAR on Post-merger Cost Efficiency Year Three ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-8.6480	4.4192	-1.9569	0.1077
POSTCOS3EFF	-18.2157	12.7416	-1.4296	0.2122
RSIZE	-0.8636	2.6069	-0.3313	0.7539
CROSS	2.6781	0.9519	2.8135	0.0374*
CASH	0.5023	0.9380	0.5355	0.6153
SERIAL	0.5444	0.5438	1.0010	0.3628
DIVPAY	-0.0021	0.0254	-0.0844	0.9360
CONC	11.9757	5.6395	2.1236	0.0871**
R-squared	0.7973	Mean of Dependent Variable		1.1602
Adj. R-squared	0.2298	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.9828	Durbin- Watson Statistic		2.7935
F-statistic	1.4049	Prob. (F-statistic)		0.3754

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.36 Regression Results for CAR on Post-merger Profit Efficiency Year One ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-4.4148	3.0203	-1.4617	0.2037
POSTPFT1EFF	7.1709	2.6527	2.7032	0.0426*
RSIZE	0.3698	1.2419	0.2978	0.7778
CROSS	-0.0978	0.3157	-0.3097	0.7692
CASH	3.5723	0.3924	9.1033	0.0003*
SERIAL	-2.2797	0.7877	-2.8943	0.0340*
DIVPAY	0.0003	0.0151	0.2094	0.8424
CONC	7.2327	4.9462	1.4623	0.2035
R-squared	0.7655	Mean of Dependent Variable		1.1602
Adj. R-squared	0.1090	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1325	Durbin- Watson Statistic		2.3495
F-statistic	1.1661	Prob. (F-statistic)		0.4673

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.37 Regression Results for CAR on Post- merger Profit Efficiency Year Two ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-4.0406	1.6737	-2.4142	0.0606**
POSTPFT2EFF	-14.8135	8.8175	-1.6800	0.1538
RSIZE	-1.9645	2.2735	-0.8641	0.4270
CROSS	1.5928	0.4209	3.7838	0.0128*
CASH	1.1107	1.4516	0.7652	0.4787
SERIAL	-1.6627	0.3589	-4.6330	0.0057*
DIVPAY	0.0061	0.0163	0.3721	0.7251
CONC	7.7487	3.6219	2.1394	0.0854**
R-squared	0.8013	Mean of Dependent Variable		1.1602
Adj. R-squared	0.2449	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.9632	Durbin- Watson Statistic		2.2833
F-statistic	1.4401	Prob. (F-statistic)		0.3637

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.38 Regression Results for CAR on Post-merger Profit Efficiency Year Three ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-2.8588	1.8865	-1.5154	0.1901
POSTPFT3EFF	-16.8142	0.7169	-23.4555	0.0000*
RSIZE	0.5953	1.0990	0.5416	0.6113
CROSS	2.2815	0.2566	8.8916	0.0003*
CASH	0.3287	0.5775	0.5691	0.5939
SERIAL	-1.3054	0.7289	-1.7908	0.1333
DIVPAY	0.0069	0.0148	0.4631	0.6628
CONC	4.9622	3.0871	1.6074	0.1689
R-squared	0.9168	Mean of Dependent Variable		1.1602
Adj. R-squared	0.6838	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.2705	Durbin- Watson Statistic		3.0997
F-statistic	3.9343	Prob. (F-statistic)		0.0693

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.39 Regression Results for CAR on Average Post-merger Cost Efficiency ($CAR_{0, +1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-8.1872	3.8409	-2.1316	0.0862**
POSTCOSAVGEFF	-25.8311	19.5376	-1.3221	0.2434
RSIZE	-0.9222	2.8673	-0.3216	0.7607
CROSS	2.3863	0.8663	2.7545	0.0401*
CASH	0.3415	1.1938	0.2860	0.7863
SERIAL	0.3194	0.6968	0.4597	0.6650
DIVPAY	-0.0041	0.0245	-0.1669	0.8740
CONC	12.0307	5.3074	2.2668	0.0727**
R-squared	0.7994	Mean of Dependent Variable		1.1602
Adj. R-squared	0.2379	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.9772	Durbin- Watson Statistic		2.8403
F-statistic	1.4236	Prob. (F-statistic)		0.3691

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.40 Regression Results for CAR on Average Post-merger Profit Efficiency ($CAR_{0,+1}$) (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-2.8747	2.0384	-1.4103	0.2175
POSTPFTAVGEFF	-28.1494	8.7398	-3.2208	0.0234*
RSIZE	-0.0875	0.9585	-0.0913	0.9308
CROSS	4.1237	0.7415	5.5611	0.0026*
CASH	-1.4687	1.0137	-1.4489	0.2070
SERIAL	-0.3425	0.5038	-0.6799	0.5268
DIVPAY	-0.0039	0.0216	-0.1820	0.8627
CONC	5.7323	3.3585	1.7068	0.1486
R-squared	0.8524	Mean of Dependent Variable		1.1602
Adj. R-squared	0.4393	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.6918	Durbin- Watson Statistic		2.9076
F-statistic	2.0630	Prob. (F-statistic)		0.2179

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

6.7 Appendix 6.3: Analysis of Pre-merger Efficiency (3 Control Variables)

Table 6.43 Regression Results for CAR on Pre-merger Bidder Cost Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.4957	1.3284	0.3732	0.7111
BIDCOSEFF	0.0082	0.0203	0.4061	0.6869
RSIZE	0.1895	0.4078	0.4647	0.6448
CROSS	-0.6101	0.2619	-2.3293	0.0253*
CASH	0.3229	0.1980	1.6310	0.1111
R-squared	0.3203	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0162	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1454	Durbin- Watson Statistic		2.1243
F-statistic	1.0533	Prob. (F-statistic)		0.4294

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.44 Regression Results for CAR on Pre-merger Bidder Profit Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.4012	0.4850	2.8889	0.0064*
BIDPFTEFF	-0.0077	0.0122	-0.6310	0.5318
RSIZE	0.2129	0.4995	0.4264	0.6723
CROSS	-0.4732	0.3018	-1.5680	0.1252
CASH	0.3440	0.2780	1.2374	0.2235
R-squared	0.3205	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0165	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1453	Durbin- Watson Statistic		2.4444
F-statistic	1.0542	Prob. (F-statistic)		0.4286

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.45 Regression Results for CAR on Pre-merger Bidder-Target Cost Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.9704	0.2803	3.4621	0.0013*
BIDTGTCOSEFF	0.0215	0.0186	1.1613	0.2528
RSIZE	0.3112	0.5549	0.5609	0.5782
CROSS	-0.4652	0.3088	-1.5064	0.1402
CASH	0.3527	0.2504	1.5085	0.1671
R-squared	0.3450	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0520	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1244	Durbin- Watson Statistic		2.2704
F-statistic	1.1776	Prob. (F-statistic)		0.3267

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.46 Regression Results for CAR on Pre-merger Bidder-Target Profit Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.0058	0.2728	3.6872	0.0007*
BIDTGTPFTEFF	0.0031	0.0112	0.2755	0.7845
RSIZE	0.2024	0.5147	0.3932	0.6964
CROSS	-0.5099	0.3086	-1.6526	0.1067
CASH	0.3184	0.3138	1.0147	0.3167
R-squared	0.3179	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0128	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1474	Durbin- Watson Statistic		2.4219
F-statistic	1.0418	Prob. (F-statistic)		0.4398

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.47 Regression Results for CAR on Pre-merger Target Cost Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	4.1617	1.4713	2.8287	0.0074*
TGTCOSEFF	-0.0444	0.0221	-2.0143	0.0511**
RSIZE	0.2226	0.4818	0.4619	0.6467
CROSS	-0.4536	0.2990	-1.5168	0.1376
CASH	0.2774	0.2527	1.0978	0.2792
R-squared	0.3661	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0825	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1062	Durbin- Watson Statistic		2.4181
F-statistic	1.2908	Prob. (F-statistic)		0.2499

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.48 Regression Results for CAR on Pre-merger Target Profit Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.0907	0.4538	2.4035	0.0212*
TGTPFTEFF	-0.0016	0.0051	-0.3131	0.7559
RSIZE	0.2057	0.5038	0.4083	0.6854
CROSS	-0.5059	0.3041	-1.6639	0.0144*
CASH	0.3327	0.2860	1.1629	0.2521
R-squared	0.3171	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0116	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1481	Durbin- Watson Statistic		2.4298
F-statistic	1.0379	Prob. (F-statistic)		0.4434

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.49 Regression Results for CAR on Pre-merger Peer-Target Cost Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.8517	0.2531	3.3656	0.0018*
PRTGTCOSEFF	0.0488	0.0174	2.8029	0.0079*
RSIZE	0.1821	0.4842	0.3761	0.7089
CROSS	-0.3552	0.3295	-1.0781	0.2878
CASH	0.2832	0.2432	1.1645	0.2515
R-squared	0.3793	Mean of Dependent Variable		0.9050
Adj. R-squared	0.1017	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.0946	Durbin- Watson Statistic		2.3653
F-statistic	1.3661	Prob. (F-statistic)		0.2075

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.50 Regression Results for CAR on Pre-merger Peer-Target Profit Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.2147	0.3829	3.1720	0.0030*
PRTGTPFTEFF	-0.0075	0.0112	-0.6714	0.5060
RSIZE	0.2758	0.4911	0.5616	0.5777
CROSS	-0.5963	0.3956	-1.5073	0.1400
CASH	0.3308	0.2787	1.1869	0.2426
R-squared	0.3267	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0255	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1399	Durbin- Watson Statistic		2.3186
F-statistic	1.0848	Prob. (F-statistic)		0.4016

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.51 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Cost Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.7992	0.3187	2.5075	0.0165*
PRBDTGTCOSEFF	0.0511	0.0310	1.6461	0.1080
RSIZE	0.1045	0.4280	0.2442	0.8084
CROSS	-0.3423	0.3840	-0.8913	0.3784
CASH	0.3459	0.2591	1.3349	0.1899
R-squared	0.3609	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0750	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1107	Durbin- Watson Statistic		2.4530
F-statistic	1.2624	Prob. (F-statistic)		0.2677

Note: *Significant at the 5% level. Variables are as defined in Tables and 2.

Table 6.52 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Profit Efficiency ($CAR_{-1,0}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.1896	0.4179	2.8464	0.0071*
PRBDTGTPFTEFF	-0.0068	0.0125	-0.5455	0.5886
RSIZE	0.2694	0.4849	0.5555	0.5818
CROSS	-0.5866	0.4056	-1.4463	0.1563
CASH	0.3182	0.2661	1.1958	0.2392
R-squared	0.3242	Mean of Dependent Variable		0.9050
Adj. R-squared	0.0219	Std. Dev of Dependent Variable		1.1548
S.E. of regression	1.1421	Durbin- Watson Statistic		2.3277
F-statistic	1.0726	Prob. (F-statistic)		0.4123

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.53 Regression Results for CAR on Pre-merger Bidder Cost Efficiency ($CAR_{0, +1}$) (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.9203	0.7425	2.5864	0.0137*
BIDCOSEFF	-0.0262	0.0149	-1.7615	0.0862**
RSIZE	-.4958	0.4338	-1.1428	0.2603
CROSS	0.4584	0.8715	0.5259	0.6020
CASH	0.5876	0.1882	3.1214	0.0034*
R-squared	0.3824	Mean of Dependent Variable		0.5758
Adj. R-squared	0.1061	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.6662	Durbin- Watson Statistic		2.4053
F-statistic	1.3839	Prob. (F-statistic)		0.1984

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.54 Regression Results for CAR on Pre-merger Bidder Profit Efficiency $CAR_{0, +1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.9311	0.4722	-1.9719	0.0559**
BIDPFTEFF	0.0081	0.0075	1.0835	0.2854
RSIZE	0.3731	0.4907	0.7605	0.4517
CROSS	0.9822	0.6610	1.4859	0.1455
CASH	0.7783	0.3162	2.4614	0.0185*
R-squared	0.4458	Mean of Dependent Variable		0.5758
Adj. R-squared	0.1978	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5784	Durbin- Watson Statistic		2.3809
F-statistic	1.7978	Prob. (F-statistic)		0.0661**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.55 Regression Results for CAR on Pre-merger Bidder-Target Cost Efficiency $CAR_{0, +1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.5381	0.1914	-2.8114	0.0078*
BIDTGTCOSEFF	0.0145	0.0273	0.5314	0.5982
RSIZE	0.4518	0.6095	0.7414	0.4630
CROSS	1.0442	0.6241	1.6690	0.1033
CASH	0.8071	0.3433	2.3506	0.0240*
R-squared	0.4496	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2033	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5729	Durbin- Watson Statistic		2.4439
F-statistic	1.8257	Prob. (F-statistic)		0.0613**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.56 Regression Results for CAR on Pre-merger Bidder-Target Profit Efficiency $CAR_{0, +1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.5145	0.2279	-2.2568	0.0299*
BIDTGTPFTEFF	-0.0026	0.0059	-0.4414	0.6615
RSIZE	0.3836	0.4786	0.8016	0.4278
CROSS	1.0198	0.6647	1.5342	0.1333
CASH	0.8028	0.3459	2.3205	0.0258*
R-squared	0.4444	Mean of Dependent Variable		0.5758
Adj. R-squared	0.1958	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5804	Durbin- Watson Statistic		2.4034
F-statistic	1.7878	Prob. (F-statistic)		0.0679**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.57 Regression Results for CAR on Pre-merger Target Cost Efficiency $CAR_{0, +1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	2.8944	2.5506	1.1348	0.2636
TGTCOSEFF	-0.0479	0.0353	-1.3603	0.1818
RSIZE	0.3989	0.4859	0.8209	0.4168
CROSS	1.0701	0.6459	1.6565	0.1059
CASH	0.7347	0.3034	2.4216	0.0203*
R-squared	0.4687	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2309	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5454	Durbin- Watson Statistic		2.3619
F-statistic	1.9718	Prob. (F-statistic)		0.0409*

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.58 Regression Results for CAR on Pre-merger Target Profit Efficiency $CAR_{0,+1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-1.6315	0.8631	-1.8902	0.0664**
TGTPFTEFF	0.0211	0.0141	1.4976	0.1425
RSIZE	0.3811	0.4402	0.8657	0.3921
CROSS	1.0359	0.6537	1.5847	0.1213
CASH	0.7669	0.3339	2.2965	0.0273*
R-squared	0.4532	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2086	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5678	Durbin- Watson Statistic		2.3590
F-statistic	1.8526	Prob. (F-statistic)		0.0569**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.59 Regression Results for CAR on Pre-merger Peer-Target Cost Efficiency $CAR_{0,+1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.6578	0.3266	-2.0139	0.0511**
PRTGTCOSEFF	0.0455	0.0399	1.1392	0.2618
RSIZE	0.3587	0.4666	0.7689	0.4467
CROSS	1.1542	0.7140	1.6165	0.1143
CASH	0.7479	0.3156	2.3698	0.0230*
R-squared	0.4674	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2291	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5473	Durbin- Watson Statistic		2.3584
F-statistic	1.9614	Prob. (F-statistic)		0.0421*

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.60 Regression Results for CAR on Pre-merger Peer-Target Profit Efficiency $CAR_{0,+1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.2718	0.4147	-0.6553	0.5162
PRTGTPFTEFF	-0.0086	0.0154	-0.5697	0.5722
RSIZE	0.4621	0.5367	0.8609	0.3947
CROSS	0.9086	0.6316	1.4386	0.1585
CASH	0.7923	0.3037	2.6085	0.0129*
R-squared	0.4497	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2036	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5728	Durbin- Watson Statistic		2.3571
F-statistic	1.8269	Prob. (F-statistic)		0.0611**

Note: *Significant at the 5% level; **Significant at the 10% level; Variables are as defined in Tables 1 and 2.

Table 6.61 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Cost Efficiency $CAR_{0, +1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.6185	0.3677	-1.6821	0.1008
PRBDTGTCOSEFF	0.0258	0.0513	0.5019	0.6187
RSIZE	0.3297	0.4166	0.7915	0.4336
CROSS	1.0969	0.7870	1.3937	0.1715
CASH	0.7999	0.3345	2.3916	0.0218*
R-squared	0.4489	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2024	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5739	Durbin- Watson Statistic		2.4212
F-statistic	1.8208	Prob. (F-statistic)		0.0621**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.62 Regression Results for CAR on Pre-merger Peer- 1/2(Bidder + Target) Profit Efficiency $CAR_{0, +1}$ (N=56)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.2415	0.4515	-0.5348	0.5959
PRBDTGTPFTEFF	-0.0101	0.0177	-0.5723	0.5705
RSIZE	0.4752	0.5533	0.8588	0.3959
CROSS	0.8932	0.6142	1.4543	0.1541
CASH	0.7736	0.3093	2.5014	0.0168*
R-squared	0.4509	Mean of Dependent Variable		0.5758
Adj. R-squared	0.2053	Std. Dev of Dependent Variable		1.7623
S.E. of regression	1.5710	Durbin- Watson Statistic		2.3384
F-statistic	1.8359	Prob. (F-statistic)		0.0596**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

6.8 Appendix 6.4: Analysis of Post-merger Efficiency (3 Control Variables)

Table 6.63 Regression Results for CAR on Post-merger Cost Efficiency Year One $CAR_{-1,0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.9121	0.6884	1.3250	0.2218
POSTCOST1EFF	0.4417	9.9049	0.0446	0.9655
RSIZE	2.0593	1.8488	1.1138	0.2977
CROSS	0.5338	0.4449	1.1999	0.2645
CASH	-0.8364	0.3417	-2.4478	0.0401*
R-squared	0.5339	Mean of Dependent Variable		1.1119
Adj. R-squared	-0.1068	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.3965	Durbin- Watson Statistic		3.9291
F-statistic	0.8334	Prob. (F-statistic)		0.6203

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.64 Regression Results for CAR on Post-merger Cost Efficiency Year Two $CAR_{-1,0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.2699	0.6346	2.0013	0.0804**
POSTCOST2EFF	-17.1333	0.0233	-735.8675	0.0000*
RSIZE	0.2789	1.1219	0.2486	0.8099
CROSS	0.9107	0.5326	1.7102	0.1256
CASH	-1.6491	0.5344	-3.0857	0.0150*
R-squared	0.7480	Mean of Dependent Variable		1.1119
Adj. R-squared	0.4015	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.0269	Durbin- Watson Statistic		3.6773
F-statistic	2.1587	Prob. (F-statistic)		0.1421

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.65 Regression Results for CAR on Post-merger Cost Efficiency Year Three $CAR_{-1,0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.7979	0.6829	1.1683	0.2763
POSTCOST3EFF	-9.4256	5.3579	-1.7592	0.1166
RSIZE	1.0033	1.9475	0.5152	0.6204
CROSS	1.1039	0.3804	2.9021	0.0198*
CASH	-1.3739	0.3519	-3.9032	0.0045*
R-squared	0.6201	Mean of Dependent Variable		1.1119
Adj. R-squared	0.0978	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2609	Durbin- Watson Statistic		3.3598
F-statistic	1.1872	Prob. (F-statistic)		0.4137

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.66 Regression Results for CAR on Post-merger Profit Efficiency Year One $CAR_{-1,\ 0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	1.0311	0.7945	1.2978	0.2305
POSTPFT1EFF	-3.3655	0.5115	-6.5797	0.0002*
RSIZE	1.9688	1.6394	1.2009	0.2641
CROSS	1.1059	0.5016	2.2046	0.0586**
CASH	-1.4608	0.0140	-104.3223	0.0000*
R-squared	0.5569	Mean of Dependent Variable		1.1119
Adj. R-squared	-0.0524	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.3618	Durbin- Watson Statistic		3.9345
F-statistic	0.9139	Prob. (F-statistic)		0.5669

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.67 Regression Results for CAR on Post- merger Profit Efficiency Year Two $CAR_{-1,\ 0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.2918	0.8763	0.3329	0.7477
POSTPFT2EFF	10.7375	1.5147	7.0891	0.0001*
RSIZE	3.6803	1.5219	2.4182	0.0420*
CROSS	0.2485	0.4371	0.5685	0.5853
CASH	-0.1925	0.2957	-0.6508	0.5334
R-squared	0.6357	Mean of Dependent Variable		1.1119
Adj. R-squared	0.1348	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2347	Durbin- Watson Statistic		4.0287
F-statistic	1.2691	Prob. (F-statistic)		0.3719

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.68 Regression Results for CAR on Post-merger Profit Efficiency Year Three $CAR_{-1,\ 0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.7737	0.5447	1.4204	0.1933
POSTPFT3EFF	4.4226	4.8137	0.9188	0.3851
RSIZE	2.1038	1.7477	1.2038	0.2631
CROSS	0.3305	0.6906	0.4786	0.6450
CASH	-0.4823	0.4113	-1.1725	0.2747
R-squared	0.5719	Mean of Dependent Variable		1.1119
Adj. R-squared	-0.0168	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.3386	Durbin- Watson Statistic		3.7855
F-statistic	0.9714	Prob. (F-statistic)		0.5311

Note: Variables are as defined in Tables 1 and 2.

Table 6.69 Regression Results for CAR on Average Post-merger Cost Efficiency $CAR_{-1, 0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.9717	0.7513	1.2933	0.2320
POSTCOSAVGEFF	-16.1008	6.8671	-2.3446	0.0471*
RSIZE	0.7675	1.7633	0.4352	0.6749
CROSS	1.0594	0.5032	2.1052	0.0684**
CASH	-1.6539	0.3692	-4.4797	0.0021**
R-squared	0.6496	Mean of Dependent Variable		1.1119
Adj. R-squared	0.1678	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.2109	Durbin- Watson Statistic		3.3118
F-statistic	1.3482	Prob. (F-statistic)		0.3433

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.70 Regression Results for CAR on Average Post-merger Profit Efficiency $CAR_{-1, 0}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.5879	0.4519	1.3006	0.2296
POSTPFTAVGEFF	7.8407	7.5388	1.0400	0.3287
RSIZE	2.5402	1.8325	1.3862	0.2031
CROSS	-0.0937	1.1157	-0.0839	0.9352
CASH	-0.0053	0.7816	-0.0068	0.9947
R-squared	0.5633	Mean of Dependent Variable		1.1119
Adj. R-squared	-0.0371	Std. Dev of Dependent Variable		1.3274
S.E. of regression	1.3519	Durbin- Watson Statistic		3.8679
F-statistic	0.9381	Prob. (F-statistic)		0.5516

Note: Variables are as defined in Tables 1 and 2.

Table 6.71 Regression Results for CAR on Post-merger Cost Efficiency Year One $CAR_{0, +1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.7628	0.1148	-6.6426	0.0002*
POSTCOST1EFF	-16.4912	17.7827	-0.9274	0.3809
RSIZE	2.0431	0.9143	2.2345	0.0559**
CROSS	2.5616	1.1069	2.3140	0.0494*
CASH	0.3598	1.1944	0.3013	0.7709
R-squared	0.6211	Mean of Dependent Variable		1.1602
Adj. R-squared	0.1002	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1431	Durbin- Watson Statistic		2.1654
F-statistic	1.1923	Prob. (F-statistic)		0.4113

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.72 Regression Results for CAR on Post-merger Cost Efficiency Year Two $CAR_{0,+1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.6674	0.3651	-1.8280	0.1050
POSTCOST2EFF	-6.3988	12.0638	-0.5304	0.6102
RSIZE	1.7864	1.0535	1.6957	0.1284
CROSS	2.4476	0.9477	2.5828	0.0325*
CASH	0.8462	1.0956	0.7724	0.4621
R-squared	0.6125	Mean of Dependent Variable		1.1602
Adj. R-squared	0.0796	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1675	Durbin- Watson Statistic		2.2668
F-statistic	1.1494	Prob. (F-statistic)		0.4323

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.73 Regression Results for CAR on Post-merger Cost Efficiency Year Three $CAR_{0,+1}$(N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.9259	0.2635	-3.5142	0.0079*
POSTCOST3EFF	-10.2451	11.8635	-0.8636	0.4130
RSIZE	1.3112	0.7757	1.6904	0.1294
CROSS	2.9217	1.5112	1.9334	0.0893**
CASH	0.5805	1.2563	0.4620	0.6564
R-squared	0.6373	Mean of Dependent Variable		1.1602
Adj. R-squared	0.1386	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.0969	Durbin- Watson Statistic		2.4685
F-statistic	1.2779	Prob. (F-statistic)		0.3724

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.74 Regression Results for CAR on Post-merger Profit Efficiency Year One $CAR_{0,+1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.7069	0.3265	-2.1651	0.0623**
POSTPFT1EFF	-2.6764	7.4769	-0.3579	0.7296
RSIZE	2.3839	0.9566	2.4921	0.0374*
CROSS	2.7589	1.8013	1.5316	0.1642
CASH	0.6621	1.7170	0.3856	0.7098
R-squared	0.6072	Mean of Dependent Variable		1.1602
Adj. R-squared	0.0669	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1822	Durbin- Watson Statistic		2.2401
F-statistic	1.1240	Prob. (F-statistic)		0.4453

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.75 Regression Results for CAR on Post- merger Profit Efficiency Year Two $CAR_{0,+1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.2551	0.7822	-0.3261	0.7527
POSTPFT2EFF	-9.4298	12.3440	-0.7639	0.4668
RSIZE	1.0142	1.8156	0.5586	0.5917
CROSS	2.5658	1.0285	2.4947	0.0373*
CASH	0.5580	1.5071	0.3703	0.7208
R-squared	0.6292	Mean of Dependent Variable		1.1602
Adj. R-squared	0.1195	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1200	Durbin- Watson Statistic		2.0754
F-statistic	1.2343	Prob. (F-statistic)		0.3917

Note: *Significant at the 5% level. Variables are as defined in Tables 1 and 2.

Table 6.76 Regression Results for CAR on Post-merger Profit Efficiency Year Three $CAR_{0, +1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-0.2180	0.3263	-0.6683	0.5228
POSTPFT3EFF	-18.4883	0.6068	-30.4709	0.0000*
RSIZE	2.2159	0.9716	2.2807	0.0520**
CROSS	3.1874	0.8804	3.6206	0.0068*
CASH	-0.4259	0.7721	-0.5516	0.5963
R-squared	0.8308	Mean of Dependent Variable		1.1602
Adj. R-squared	0.5982	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.4321	Durbin- Watson Statistic		2.0969
F-statistic	3.5715	Prob. (F-statistic)		0.0408*

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.77 Regression Results for CAR on Average Post-merger Cost Efficiency $CAR_{0, +1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-.7519	0.1326	-5.6717	0.0005*
POSTCOSAVGEFF	-13.4026	17.4069	-0.7699	0.4635
RSIZE	1.3809	0.9153	1.5087	0.1698
CROSS	2.7412	1.3365	2.0511	0.0744**
CASH	0.4788	1.4683	0.3261	0.7527
R-squared	0.6298	Mean of Dependent Variable		1.1602
Adj. R-squared	0.1208	Std. Dev of Dependent Variable		2.2592
S.E. of regression	2.1184	Durbin- Watson Statistic		2.3961
F-statistic	1.2373	Prob. (F-statistic)		0.3903

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

Table 6.78 Regression Results for CAR on Average Post-merger Profit Efficiency $CAR_{0,+1}$ (N=20)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.6344	0.4585	1.3838	0.2038
POSTPFTAVGEFF	-34.5982	10.6441	-3.2505	0.0117*
RSIZE	0.2772	1.0098	0.2745	0.7906
CROSS	5.1081	1.3725	3.7216	0.0059*
CASH	-2.6177	1.2426	-2.1066	0.0682**
R-squared	0.7995	Mean of Dependent Variable		1.1602
Adj. R-squared	0.5238	Std. Dev of Dependent Variable		2.2592
S.E. of regression	1.5590	Durbin- Watson Statistic		2.6428
F-statistic	2.8999	Prob. (F-statistic)		0.0707**

Note: *Significant at the 5% level; **Significant at the 10% level. Variables are as defined in Tables 1 and 2.

6.9 Appendix 6.5: Diagnostic Tests

(i) Model Specification – Ramsey RESET Test

Ramsey RESET Test: BIDCOSEFF			
F-statistic	3.444918	Prob. F(1,47)	0.0697
Log likelihood ratio	3.961126	Prob. Chi-squared (1)	0.0466

Ramsey RESET Test: BIDPFTEFF			
F-statistic	3.236784	Prob. F(1,47)	0.0784
Log likelihood ratio	3.729594	Prob. Chi-squared (1)	0.0535

Ramsey RESET Test: BIDTGTCOSEFF			
F-statistic	1.904609	Prob. F(1,47)	0.1741
Log likelihood ratio	2.224546	Prob. Chi-squared (1)	0.1358

Ramsey RESET Test: BIDTGTPFTEFF			
F-statistic	7.103838	Prob. F(1,47)	0.0105
Log likelihood ratio	7.882421	Prob. Chi-squared (1)	0.005

Ramsey RESET Test: TGTCOSEFF			
F-statistic	0.344059	Prob. F(1,47)	0.5603
Log likelihood ratio	0.40845	Prob. Chi-squared (1)	0.5228

Ramsey RESET Test: TGTPFTEFF			
F-statistic	3.826192	Prob. F(1,47)	0.0564
Log likelihood ratio	4.382796	Prob. Chi-squared (1)	0.0363

Ramsey RESET Test: PRTGTCOSEFF			
F-statistic	1.392237	Prob. F(1,47)	0.244
Log likelihood ratio	1.634741	Prob. Chi-squared (1)	0.201

Ramsey RESET Test: PRTGTEFF			
F-statistic	1.214864	Prob. F(1,47)	0.276
Log likelihood ratio	1.429106	Prob. Chi-squared (1)	0.2319

Ramsey RESET Test: PRBDTGTCOSEFF			
F-statistic	1.501934	Prob. F(1,47)	0.2265
Log likelihood ratio	1.76154	Prob. Chi-squared (1)	0.1844

Ramsey RESET Test: PRBDTGTPFTEFF			
F-statistic	1.782351	Prob. F(1,47)	0.1883
Log likelihood ratio	2.084376	Prob. Chi-squared (1)	0.1488

Ramsey RESET Test: POSTCOST1EFF			
F-statistic	1.513548	Prob. F(1,47)	0.2443
Log likelihood ratio	2.578333	Prob. Chi-squared (1)	0.1083

Ramsey RESET Test: POSTCOST2EFF			
F-statistic	1.630201	Prob. F(1,47)	0.228
Log likelihood ratio	2.763912	Prob. Chi-squared (1)	0.0964

Ramsey RESET Test: POSTCOST3EFF			
F-statistic	0.532425	Prob. F(1,47)	0.4808
Log likelihood ratio	0.945348	Prob. Chi-squared (1)	0.3309

Ramsey RESET Test: POSTPFT1EFF			
F-statistic	0.0088982	Prob. F(1,47)	0.9262
Log likelihood ratio	0.016323	Prob. Chi-squared (1)	0.8983

Ramsey RESET Test: POSTPFT2EFF			
F-statistic	12.80169	Prob. F(1,47)	0.0043
Log likelihood ratio	15.43723	Prob. Chi-squared (1)	0.0001

Ramsey RESET Test: POSTPFT3EFF			
F-statistic	5.63242	Prob. F(1,47)	0.0369
Log likelihood ratio	8.26917	Prob. Chi-squared (1)	0.004

Ramsey RESET Test: POSTCOSTAVGEFF			
F-statistic	0.715249	Prob. F(1,47)	0.4157
Log likelihood ratio	1.259922	Prob. Chi-squared (1)	0.2617

Ramsey RESET Test: POSTPFTAVGEFF			
F-statistic	1.926769	Prob. F(1,47)	0.1926
Log likelihood ratio	3.2281	Prob. Chi-squared (1)	0.0724

(ii) Heteroscedasticity Test: Breusch-Pagan-Godfrey

Heteroscedasticity Test: Breusch-Pagan-Godfrey (BIDCOSEFF)			
F-statistic	0.62051	Prob. (7, 48)	0.7363
Obs*R-squared	4.646985	Prob. Chi-Square (7)	0.7030
Scaled Explained SS	3.186176	Prob. Chi-Square (7)	0.8673

Heteroscedasticity Test: Breusch-Pagan-Godfrey (BIDPFTEFF)			
F-statistic	0.60111	Prob. (7, 48)	0.7519
Obs*R-squared	4.51341	Prob. Chi-Square (7)	0.7191
Scaled Explained SS	3.233265	Prob. Chi-Square (7)	0.8626

Heteroscedasticity Test: Breusch-Pagan-Godfrey (BIDTGTCOSEFF)			
F-statistic	1.128247	Prob. (7, 48)	0.3615
Obs*R-squared	7.91218	Prob. Chi-Square (7)	0.3404
Scaled Explained SS	5.13724	Prob. Chi-Square (7)	0.6432

Heteroscedasticity Test: Breusch-Pagan-Godfrey (BIDTGTPFTEFF)			
F-statistic	0.328699	Prob. (7, 48)	0.9371
Obs*R-squared	2.561586	Prob. Chi-Square (7)	0.9224
Scaled Explained SS	1.714468	Prob. Chi-Square (7)	0.9739

Heteroscedasticity Test: Breusch-Pagan-Godfrey (TGTCOSEFF)			
F-statistic	1.546658	Prob. (7, 48)	0.1746
Obs*R-squared	10.30639	Prob. Chi-Square (7)	0.1719
Scaled Explained SS	7.834038	Prob. Chi-Square (7)	0.3475

Heteroscedasticity Test: Breusch-Pagan-Godfrey (TGTPFTEFF)			
F-statistic	0.51125	Prob. (7, 48)	0.8215
Obs*R-squared	3.885514	Prob. Chi-Square (7)	0.7929
Scaled Explained SS	2.610809	Prob. Chi-Square (7)	0.9185

Heteroscedasticity Test: Breusch-Pagan-Godfrey (PRTGTCOSEFF)			
F-statistic	0.726773	Prob. (7, 48)	0.6500
Obs*R-squared	5.366526	Prob. Chi-Square (7)	0.6153
Scaled Explained SS	4.292331	Prob. Chi-Square (7)	0.7456

Heteroscedasticity Test: Breusch-Pagan-Godfrey (PRTGTPFTEFF)			
F-statistic	1.046343	Prob. (7, 48)	0.4122
Obs*R-squared	7.413844	Prob. Chi-Square (7)	0.3871
Scaled Explained SS	4.76354	Prob. Chi-Square (7)	0.6888

Heteroscedasticity Test: Breusch-Pagan-Godfrey (PRBDTGTCOSEFF)			
F-statistic	0.752576	Prob. (7, 48)	0.6292
Obs*R-squared	5.538217	Prob. Chi-Square (7)	0.5946
Scaled Explained SS	4.312077	Prob. Chi-Square (7)	0.7432

Heteroscedasticity Test: Breusch-Pagan-Godfrey (PRBDTGTPFTEFF)			
F-statistic	0.885367	Prob. (7, 48)	0.5252
Obs*R-squared	6.403682	Prob. Chi-Square (7)	0.4935
Scaled Explained SS	4.044204	Prob. Chi-Square (7)	0.7747

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTCOST1EFF)			
F-statistic	0.459679	Prob. (7, 48)	0.8455
Obs*R-squared	4.228948	Prob. Chi-Square (7)	0.7531
Scaled Explained SS	1.311555	Prob. Chi-Square (7)	0.9881

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTCOST2EFF)			
F-statistic	1.0969	Prob. (7, 48)	0.4143
Obs*R-squared	6.722095	Prob. Chi-Square (7)	0.3473
Scaled Explained SS	2.370043	Prob. Chi-Square (7)	0.8827

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTCOST3EFF)			
F-statistic	1.662067	Prob. (7, 48)	0.2136
Obs*R-squared	1.690633	Prob. Chi-Square (7)	0.1935
Scaled Explained SS	0.840685	Prob. Chi-Square (7)	0.3592

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTPFT1EFF)			
F-statistic	0.277287	Prob. (7, 48)	0.9377
Obs*R-squared	2.269168	Prob. Chi-Square (7)	0.8934
Scaled Explained SS	1.312305	Prob. Chi-Square (7)	0.971

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTPFT2EFF)			
F-statistic	1.553696	Prob. (7, 48)	0.2397
Obs*R-squared	9.508596	Prob. Chi-Square (7)	0.2182
Scaled Explained SS	2.137759	Prob. Chi-Square (7)	0.9518

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTPFT3EFF)			
F-statistic	0.644692	Prob. (7, 48)	0.7128
Obs*R-squared	5.465857	Prob. Chi-Square (7)	0.6033
Scaled Explained SS	1.310256	Prob. Chi-Square (7)	0.9882

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTCOSAVGEFF)			
F-statistic	0.331483	Prob. (7, 48)	0.9245
Obs*R-squared	3.240668	Prob. Chi-Square (7)	0.8619
Scaled Explained SS	0.971251	Prob. Chi-Square (7)	0.9953

Heteroscedasticity Test: Breusch-Pagan-Godfrey (POSTPFTAVGEFF)			
F-statistic	0.510529	Prob. (7, 48)	0.8101
Obs*R-squared	4.589405	Prob. Chi-Square (7)	0.7099
Scaled Explained SS	0.962546	Prob. Chi-Square (7)	0.9954

(iii) Multi-collinearity Tests

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	BIDCOSEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.015	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
BIDCOSEFF	-0.015	1.000							0.905	1.105
RSIZE	0.090	-0.120	1.000						0.947	1.056
CROSS	-0.261	0.028	-0.037	1.000					0.931	1.074
CASH	0.129	-0.078	-0.172	0.102	1.000				0.919	1.088
SERIAL	-0.309	0.072	0.057	0.073	-0.036	1.000			0.939	1.065
DIVPAY	-0.054	-0.143	0.025	0.159	-0.131	0.197	1.000		0.890	1.124
CONC	-0.144	-0.186	0.049	0.133	-0.056	-0.079	0.046	1.000	0.932	1.072

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	BIDPFTEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.126	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
BIDPFTEFF	-0.126	1.000							0.866	1.155
RSIZE	0.090	-0.052	1.000						0.963	1.039
CROSS	-0.261	0.143	-0.037	1.000					0.917	1.090
CASH	0.129	0.109	-0.172	0.102	1.000				0.933	1.072
SERIAL	-0.309	0.218	0.057	0.073	-0.036	1.000			0.879	1.138
DIVPAY	-0.054	-0.174	0.25	0.159	-0.131	0.197	1.000		0.866	1.155
CONC	-0.144	0.052	0.049	0.133	-0.056	-0.079	0.046	1.000	0.960	1.042

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	BIDTGTCOSEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.112	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
BIDTGTCOSEFF	0.112	1.000							0.935	1.069
RSIZE	0.090	-0.027	1.000						0.964	1.038
CROSS	-0.261	0.033	-0.037	1.000					0.934	1.070
CASH	0.129	-0.022	-0.172	0.102	1.000				0.934	1.070
SERIAL	-0.309	0.157	0.057	0.073	-0.036	1.000			0.916	1.092
DIVPAY	-0.054	-0.136	0.025	0.159	-0.131	0.197	1.000		0.889	1.124
CONC	-0.144	-0.087	0.049	0.133	-0.056	-0.079	0.046	1.000	0.960	1.041

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	BIDTGTPFTEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.088	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
BIDTGTPFTEFF	0.088	1.000							0.870	1.149
RSIZE	0.090	-0.014	1.000						0.965	1.036
CROSS	-0.261	0.001	-0.037	1.000					0.933	1.072
CASH	0.129	0.035	-0.172	0.102	1.000				0.937	1.067
SERIAL	-0.309	0.060	0.057	0.073	-0.036	1.000			0.938	1.066
DIVPAY	-0.054	-0.270	0.025	0.159	-0.131	0.197	1.000		0.843	1.186
CONC	-0.144	-0.220	0.049	0.133	-0.056	-0.079	0.046	1.000	0.921	1.086

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	TGTCOSEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.191	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
TGTCOSEFF	-0.191	1.000							0.946	1.057
RSIZE	0.090	-0.094	1.000						0.957	1.045
CROSS	-0.261	-0.019	-0.037	1.000					0.938	1.066
CASH	0.129	-0.053	-0.172	0.102	1.000				0.933	1.072
SERIAL	-0.309	-0.165	0.057	0.073	-0.036	1.000			0.915	1.093
DIVPAY	-0.054	0.052	0.025	0.159	-0.131	0.197	1.000		0.913	1.095
CONC	-0.144	-0.072	0.049	0.133	-0.056	-0.079	0.046	1.000	0.958	1.044

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	TGTPFTEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.084	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
TGTPFTEFF	-0.084	1.000							0.792	1.262
RSIZE	0.090	-0.078	1.000						0.959	1.043
CROSS	-0.261	-0.002	-0.037	1.000					0.926	1.080
CASH	0.129	0.163	-0.172	0.102	1.000				0.893	1.120
SERIAL	-0.309	0.024	0.057	0.073	-0.036	1.000			0.945	1.058
DIVPAY	-0.054	0.138	0.025	0.159	-0.131	0.197	1.000		0.894	1.119
CONC	-0.144	0.369	0.049	0.133	-0.056	-0.079	0.046	1.000	0.812	1.232

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	PRTGTCOSEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000		0.090	-0.261	0.129	-0.309	-0.054	-0.144		
PRTGTCOSEFF		1.000							0.938	1.066
RSIZE	0.090		1.000						0.959	1.043
CROSS	-0.261		-0.037	1.000					0.930	1.075
CASH	0.129		-0.172	0.102	1.000				0.932	1.073
SERIAL	-0.309		0.057	0.073	-0.036	1.000			0.921	1.086
DIVPAY	-0.054		0.025	0.159	-0.131	0.197	1.000		0.919	1.089
CONC	-0.144		0.049	0.133	-0.056	-0.079	0.046	1.000	0.956	1.046

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	PRTGTPFTEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.038	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
PRTGTPFTEFF	-0.038	1.000							0.815	1.226
RSIZE	0.090	0.178	1.000						0.942	1.062
CROSS	-0.261	-0.335	-0.037	1.000					0.850	1.176
CASH	0.129	-0.207	-0.172	0.102	1.000				0.909	1.100
SERIAL	-0.309	-0.133	0.057	0.073	-0.036	1.000			0.935	1.070
DIVPAY	-0.054	-0.118	0.025	0.159	-0.131	0.197	1.000		0.913	1.095
CONC	-0.144	0.029	0.049	0.133	-0.056	-0.079	0.046	1.000	0.963	1.038

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	PRBDTGTCOSEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.178	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
PRBDTGTCOSEFF	0.178	1.000							0.831	1.203
RSIZE	0.090	0.152	1.000						0.953	1.049
CROSS	-0.261	-0.216	-0.037	1.000					0.872	1.146
CASH	0.129	-0.207	-0.172	0.102	1.000				0.921	1.086
SERIAL	-0.309	0.119	0.057	0.073	-0.036	1.000			0.935	1.069
DIVPAY	-0.054	0.191	0.025	0.159	-0.131	0.197	1.000		0.886	1.129
CONC	-0.144	0.144	0.049	0.133	-0.056	-0.079	0.046	1.000	0.936	1.069

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=56)								Collinearity Statistics	
	CAR	PRBDTGTPFTEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.046	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
PRBDTGTPFTEFF	-0.046	1.000							0.806	1.240
RSIZE	0.090	0.184	1.000						0.940	1.064
CROSS	-0.261	-0.350	-0.037	1.000					0.826	1.211
CASH	0.129	-0.195	-0.172	0.102	1.000				0.919	1.088
SERIAL	-0.309	-0.123	0.057	0.073	-0.036	1.000			0.934	1.070
DIVPAY	-0.054	-0.026	0.025	0.159	-0.131	0.197	1.000		0.919	1.088
CONC	-0.144	0.085	0.049	0.133	-0.056	-0.079	0.046	1.000	0.953	1.050

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTCOST1EFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.117	0.383	-0.115	0.149	-0.602	0.023	0.007		
POSTCOST1EFF	0.117	1.000							0.684	1.461
RSIZE	0.383		1.000						0.637	1.571
CROSS	-0.115		-0.255	1.000					0.673	1.487
CASH	0.149		0.006	0.192	1.000				0.712	1.404
SERIAL	-0.602		-0.372	-0.101	-0.101	1.000			0.620	1.612
DIVPAY	0.023		-0.063	0.284	0.329	0.204	1.000		0.634	1.577
CONC	0.007		0.132	0.325	0.011	-3.98	0.083	1.000	0.732	1.366

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTCOST2EFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.372	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTCOST2EFF	-0.372	1.000							0.630	1.587
RSIZE	0.090	-0.388	1.000						0.672	1.487
CROSS	-0.261	0.061	-0.255	1.000					0.720	1.389
CASH	0.129	-0.310	0.006	0.192	1.000				0.797	1.255
SERIAL	-0.309	0.277	-0.372	-0.101	-0.101	1.000			0.588	1.700
DIVPAY	-0.054	-0.181	-0.063	0.284	0.329	0.204	1.000		0.708	1.413
CONC	-0.144	0.150	0.132	0.325	0.011	-3.98	0.083	1.000	0.649	1.541

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTCOST3EFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.093	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTCOST3EFF	-0.093	1.000							0.842	1.188
RSIZE	0.090	-0.260	1.000						0.736	1.359
CROSS	-0.261	0.245	-0.255	1.000					0.694	1.441
CASH	0.129	-0.168	0.006	0.192	1.000				0.811	1.234
SERIAL	-0.309	0.115	-0.372	-0.101	-0.101	1.000			0.644	1.553
DIVPAY	-0.054	0.025	-0.063	0.284	0.329	0.204	1.000		0.751	1.331
CONC	-0.144	0.121	0.132	0.325	0.011	-3.98	0.083	1.000	0.726	1.377

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTPFT1EFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.009	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTPFT1EFF	-0.009	1.000							0.658	1.519
RSIZE	0.090	-0.373	1.000						0.726	1.377
CROSS	-0.261	0.331	-0.255	1.000					0.601	1.663
CASH	0.129	-0.257	0.006	0.192	1.000				0.770	1.298
SERIAL	-0.309	0.233	-0.372	-0.101	-0.101	1.000			0.631	1.584
DIVPAY	-0.054	-0.083	-0.063	0.284	0.329	0.204	1.000		0.732	1.367
CONC	-0.144	-0.071	0.132	0.325	0.011	-3.98	0.083	1.000	0.727	1.375

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTPFT2EFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.148	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTPFT2EFF	0.148	1.000							0.664	1.505
RSIZE	0.090	-0.477	1.000						0.568	1.760
CROSS	-0.261	0.182	-0.255	1.000					0.720	1.390
CASH	0.129	-0.233	0.006	0.192	1.000				0.758	1.320
SERIAL	-0.309	0.034	-0.372	-0.101	-0.101	1.000			0.626	1.599
DIVPAY	-0.054	0.036	-0.063	0.284	0.329	0.204	1.000		0.738	1.355
CONC	-0.144	0.087	0.132	0.325	0.011	-3.98	0.083	1.000	0.732	1.366

Pearson Correlations and Collinearity Statistics

	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTPFT3EFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.301	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTPFT3EFF	0.301	1.000							0.790	1.267
RSIZE	0.090	0.028	1.000						0.759	1.318
CROSS	-0.261	0.164	-0.255	1.000					0.683	1.465
CASH	0.129	-0.273	0.006	0.192	1.000				0.718	1.392
SERIAL	-0.309	-0.175	-0.372	-0.101	-0.101	1.000			0.602	1.662
DIVPAY	-0.054	0.014	-0.063	0.284	0.329	0.204	1.000		0.733	1.363
CONC	-0.144	-0.018	0.132	0.325	0.011	-3.98	0.083	1.000	0.700	1.428

Pearson Correlations and Collinearity Statistics

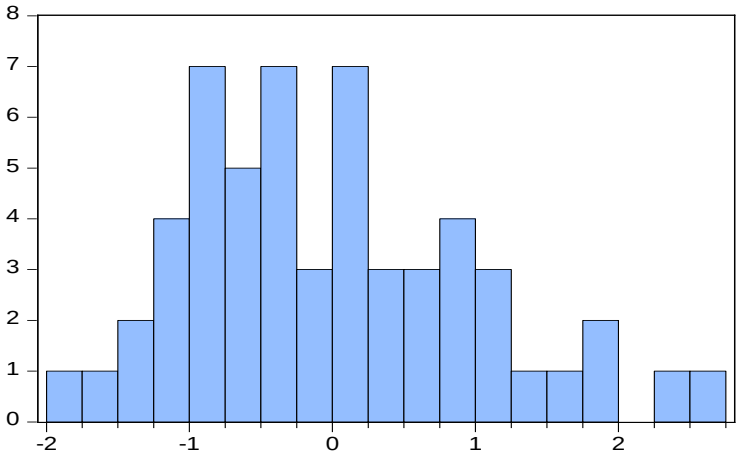
	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTCOSAVGEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	-0.149	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTCOSAVGEFF	-0.149	1.000							0.764	1.308
RSIZE	0.090	-0.348	1.000						0.686	1.457
CROSS	-0.261	0.120	-0.255	1.000					0.719	1.390
CASH	0.129	-0.273	0.006	0.192	1.000				0.776	1.289
SERIAL	-0.309	0.173	-0.372	-0.101	-0.101	1.000			0.643	1.555
DIVPAY	-0.054	0.000	-0.063	0.284	0.329	0.204	1.000		0.751	1.332
CONC	-0.144	0.126	0.132	0.325	0.011	-3.98	0.083	1.000	0.708	1.412

Pearson Correlations and Collinearity Statistics

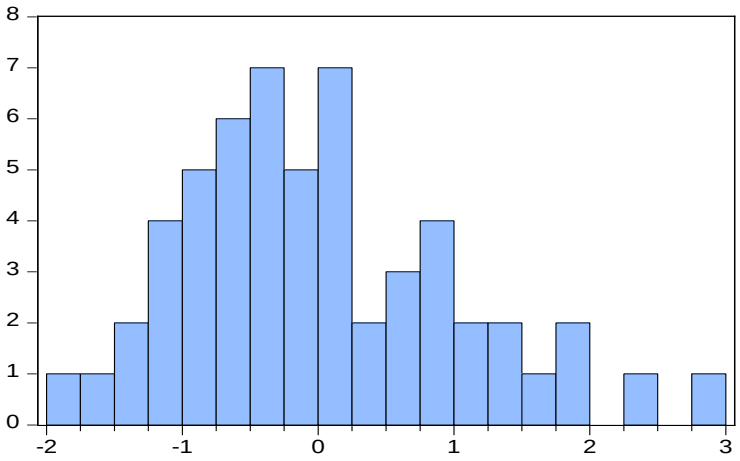
	Pearson Correlations (N=20)								Collinearity Statistics	
	CAR	POSTPFTAVGEFF	RSIZE	CROSS	CASH	SERIAL	DIVPAY	CONC	Tolerance	VIF
CAR	1.000	0.149	0.090	-0.261	0.129	-0.309	-0.054	-0.144		
POSTPFTAVGEFF	0.149	1.000							0.631	1.585
RSIZE	0.090	-0.376	1.000						0.692	1.445
CROSS	-0.261	0.332	-0.255	1.000					0.620	1.614
CASH	0.129	0.339	0.006	0.192	1.000				0.686	1.458
SERIAL	-0.309	0.098	-0.372	-0.101	-0.101	1.000			0.646	1.548
DIVPAY	-0.054	-0.039	-0.063	0.284	0.329	0.204	1.000		0.751	1.331
CONC	-0.144	-0.027	0.132	0.325	0.011	-3.98	0.083	1.000	0.721	1.388

(iv) Test of Normality

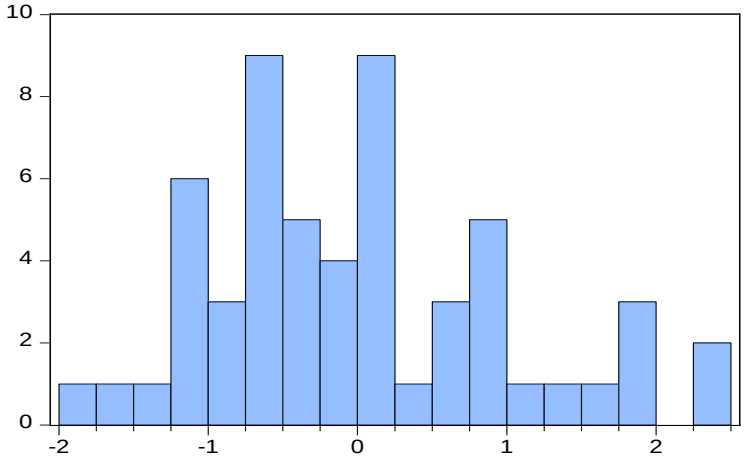
Histograms for BIDCOSEFF, BIDPFTEFF, BIDTGTCOSEFF, BIDTGTPFTEFF, TGTCOSEFF, TGTPFTEFF, PRTGTCOSEFF, PRTGTPFTEFF, PRBDTGTCOSEFF, PRBDTGTPFTEFF, POSTCOS1EFF, POSTCOS2EFF, POSTCOS3EFF, POSTPFT1EFF, POSTPFT2EFF, POSTPFT3EFF, POSTCOSAVGEFF, POSTPFTAVGEFF, respectively.



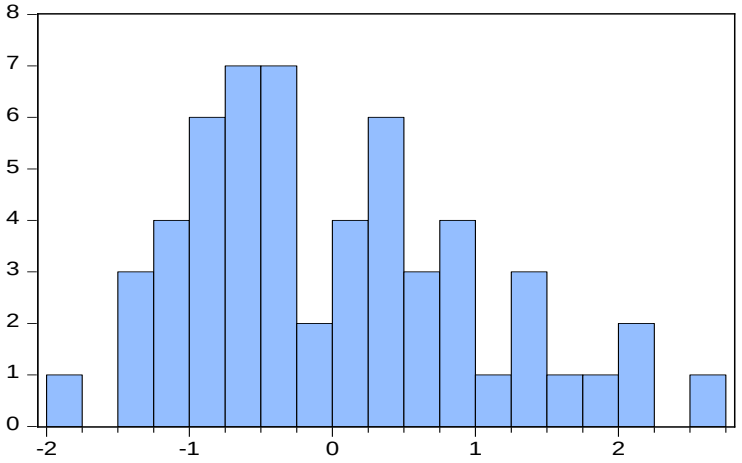
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	-1.11e-16
Median	-0.177003
Maximum	2.681754
Minimum	-1.952935
Std. Dev.	1.024968
Skewness	0.576404
Kurtosis	2.866474
Jarque-Bera	3.142523
Probability	0.207783



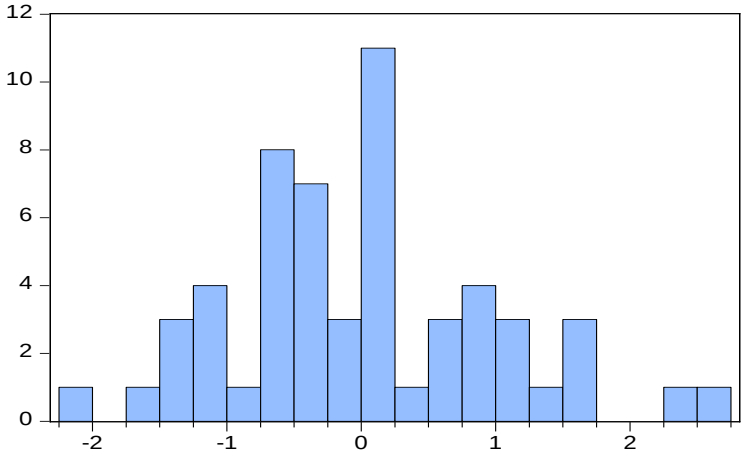
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	4.36e-17
Median	-0.170599
Maximum	2.765848
Minimum	-1.958448
Std. Dev.	1.025429
Skewness	0.584134
Kurtosis	2.950114
Jarque-Bera	3.190459
Probability	0.202862



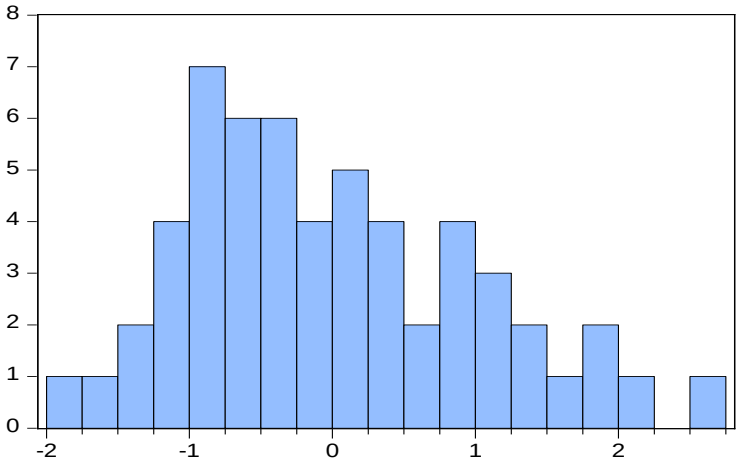
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	1.15e-16
Median	-0.172137
Maximum	2.423289
Minimum	-1.989037
Std. Dev.	1.004146
Skewness	0.526735
Kurtosis	2.767491
Jarque-Bera	2.715672
Probability	0.257217



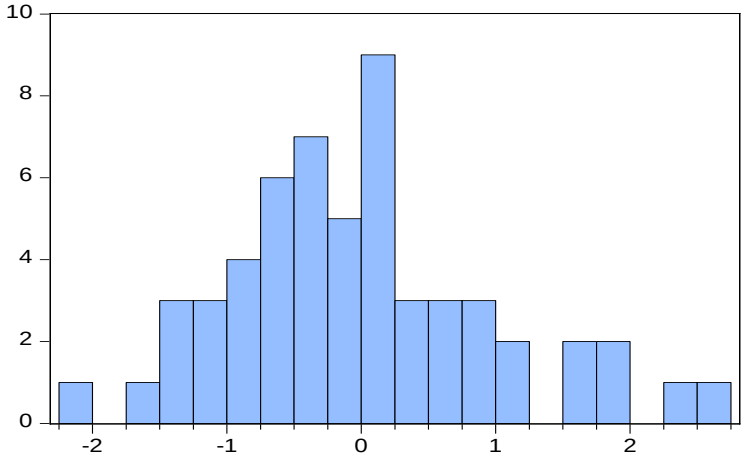
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	1.47e-16
Median	-0.179680
Maximum	2.737553
Minimum	-1.904602
Std. Dev.	1.019209
Skewness	0.598052
Kurtosis	2.821981
Jarque-Bera	3.412158
Probability	0.181576



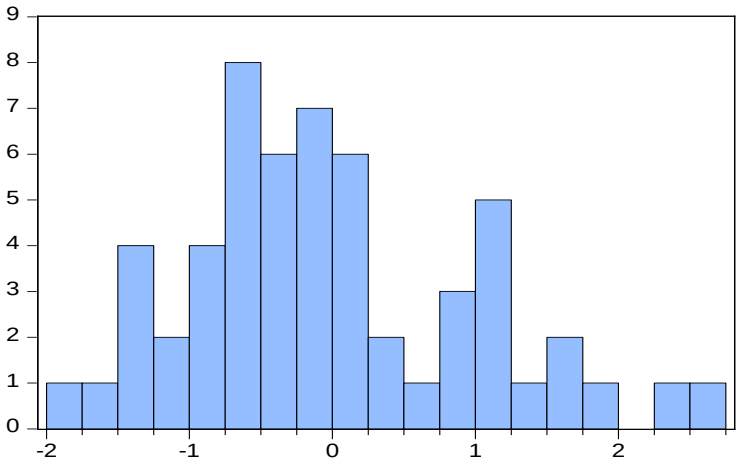
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	-2.05e-15
Median	-0.055655
Maximum	2.604404
Minimum	-2.143248
Std. Dev.	0.985024
Skewness	0.444729
Kurtosis	3.069201
Jarque-Bera	1.857156
Probability	0.395115



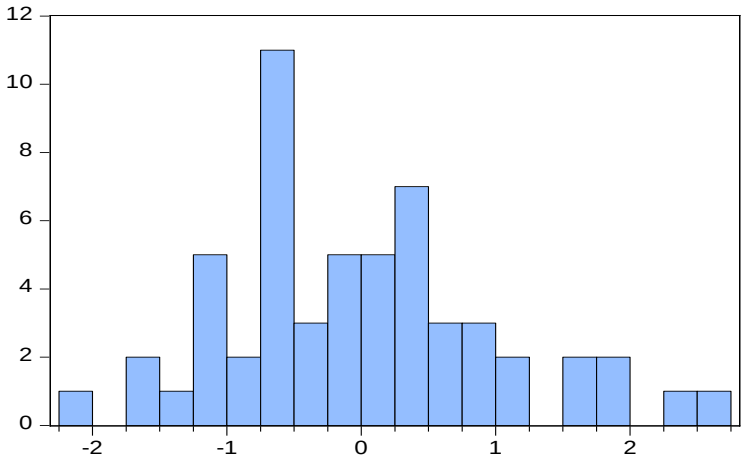
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	-1.17e-16
Median	-0.197215
Maximum	2.742406
Minimum	-1.899320
Std. Dev.	1.023267
Skewness	0.588254
Kurtosis	2.829154
Jarque-Bera	3.297839
Probability	0.192258



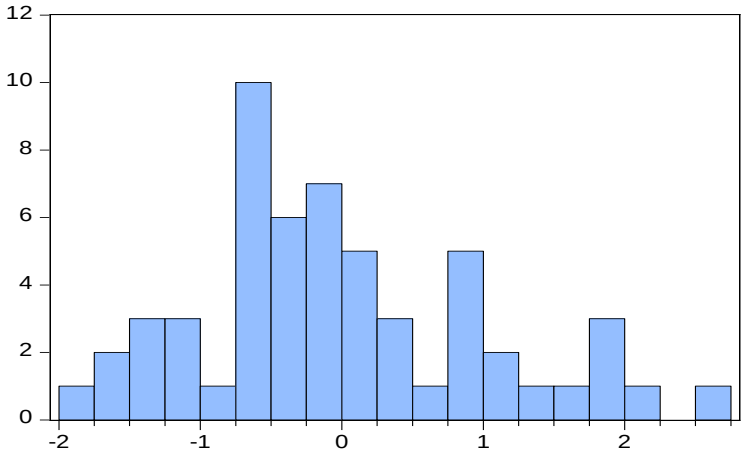
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	-2.78e-17
Median	-0.144983
Maximum	2.677538
Minimum	-2.032072
Std. Dev.	0.994385
Skewness	0.574162
Kurtosis	3.177327
Jarque-Bera	3.150212
Probability	0.206986



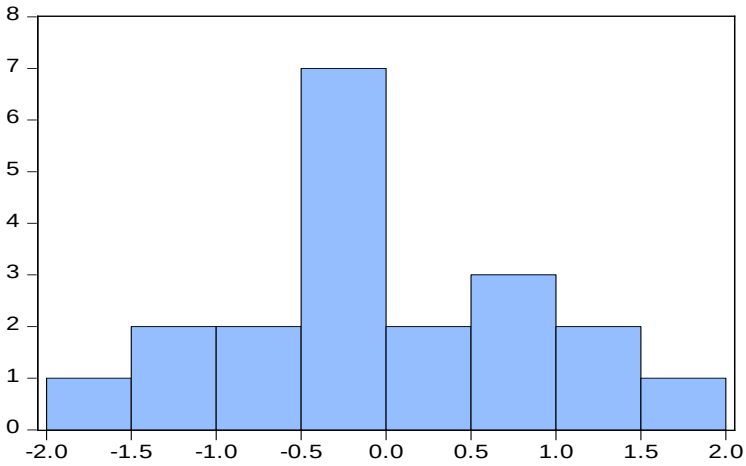
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	-2.93e-16
Median	-0.108697
Maximum	2.564781
Minimum	-1.850653
Std. Dev.	1.010324
Skewness	0.520583
Kurtosis	2.749081
Jarque-Bera	2.676306
Probability	0.262330



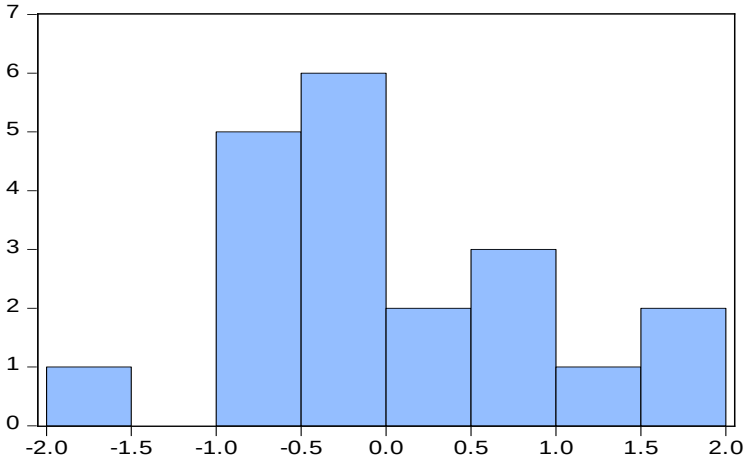
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	2.50e-16
Median	-0.082843
Maximum	2.650341
Minimum	-2.032762
Std. Dev.	0.998828
Skewness	0.519127
Kurtosis	3.119532
Jarque-Bera	2.548606
Probability	0.279626



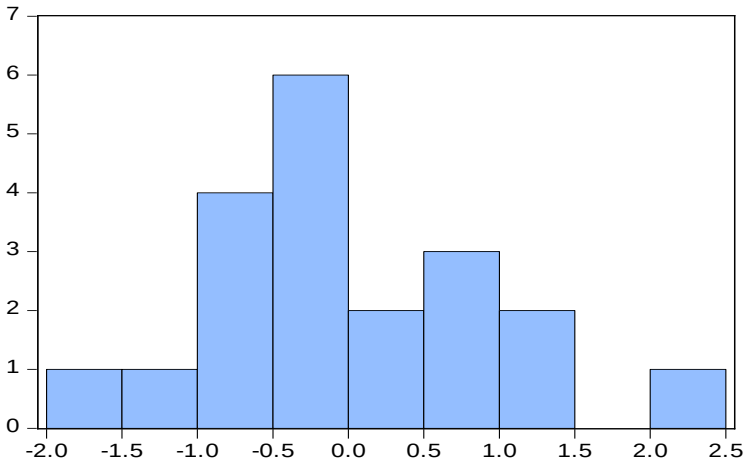
Series: Residuals	
Sample 1 56	
Observations 56	
Mean	1.55e-16
Median	-0.137700
Maximum	2.547868
Minimum	-1.777965
Std. Dev.	1.007582
Skewness	0.533714
Kurtosis	2.719202
Jarque-Bera	2.842585
Probability	0.241402



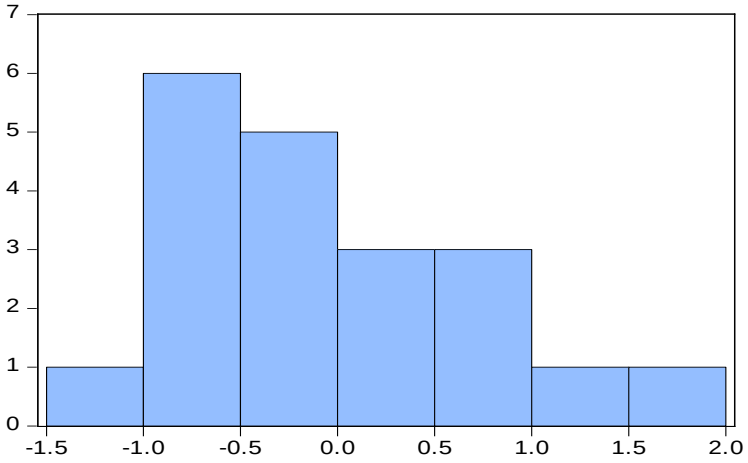
Series: Residuals	
Sample 1 20	
Observations 20	
Mean	-3.05e-16
Median	-0.149781
Maximum	1.932136
Minimum	-1.749366
Std. Dev.	0.896472
Skewness	0.247883
Kurtosis	2.722986
Jarque-Bera	0.268767
Probability	0.874255



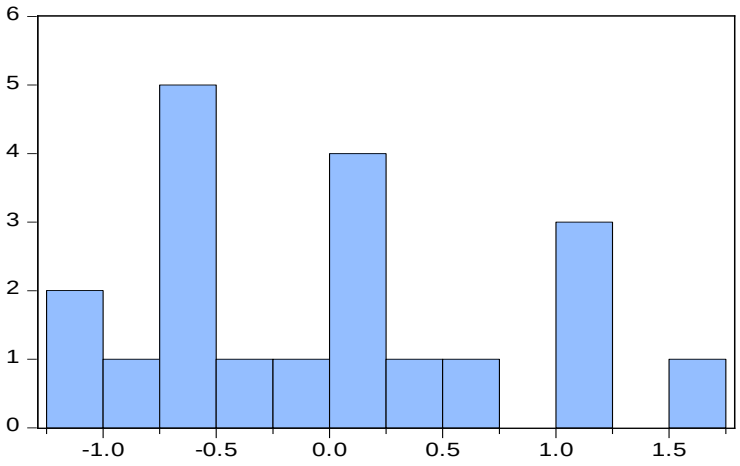
Series: Residuals	
Sample 1 20	
Observations 20	
Mean	-4.44e-17
Median	-0.215301
Maximum	1.900407
Minimum	-1.654935
Std. Dev.	0.932627
Skewness	0.502636
Kurtosis	2.519716
Jarque-Bera	1.034370
Probability	0.596197



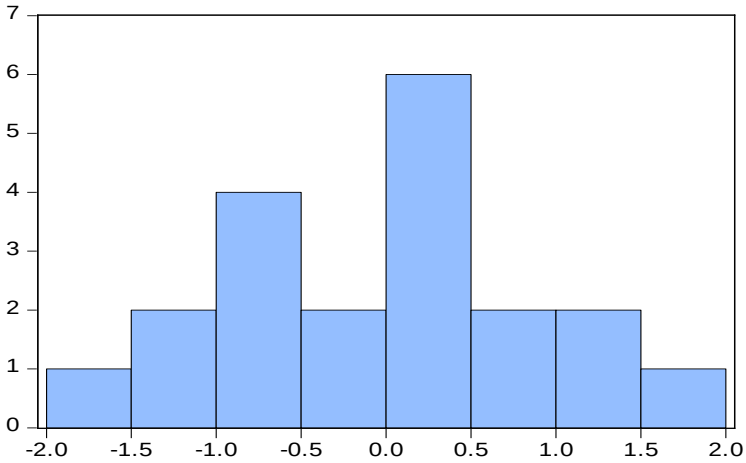
Series: Residuals	
Sample 1 20	
Observations 20	
Mean	-8.88e-17
Median	-0.300428
Maximum	2.072940
Minimum	-1.614217
Std. Dev.	0.924372
Skewness	0.549309
Kurtosis	2.684854
Jarque-Bera	1.088566
Probability	0.580258



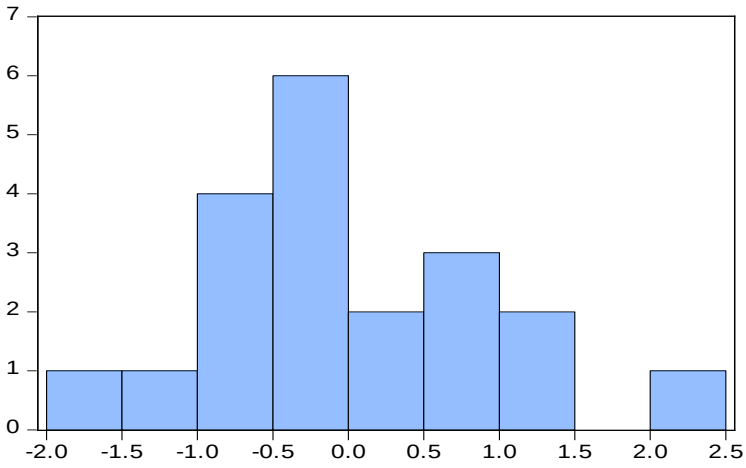
Series: Residuals	
Sample 1 20	
Observations 20	
Mean	1.67e-16
Median	-0.075898
Maximum	1.967925
Minimum	-1.184179
Std. Dev.	0.831309
Skewness	0.744859
Kurtosis	2.918098
Jarque-Bera	1.854974
Probability	0.395546



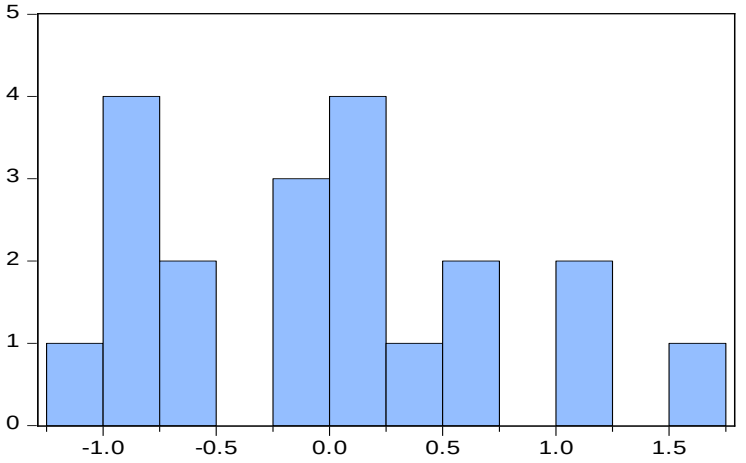
Series: Residuals	
Sample 1 20	
Observations 20	
Mean	3.39e-16
Median	-0.092474
Maximum	1.679686
Minimum	-1.214033
Std. Dev.	0.812561
Skewness	0.441069
Kurtosis	2.249021
Jarque-Bera	1.118447
Probability	0.571653



Series: Residuals	
Sample 1 20	
Observations 20	
Mean	1.44e-16
Median	0.032450
Maximum	1.707930
Minimum	-1.504082
Std. Dev.	0.887331
Skewness	0.227192
Kurtosis	2.331759
Jarque-Bera	0.544177
Probability	0.761787



Series: Residuals	
Sample 1 20	
Observations 20	
Mean	0.000000
Median	-0.295305
Maximum	2.040081
Minimum	-1.670596
Std. Dev.	0.925516
Skewness	0.486752
Kurtosis	2.665040
Jarque-Bera	0.883256
Probability	0.642989



Series: Residuals	
Sample 1 20	
Observations 20	
Mean	1.50e-16
Median	-0.004412
Maximum	1.526524
Minimum	-1.059559
Std. Dev.	0.758368
Skewness	0.322251
Kurtosis	2.165178
Jarque-Bera	0.926924
Probability	0.629102

7

Conclusion

7.0 Introduction

This study investigates whether markets take bank efficiency into account when setting stock prices after merger announcement. In other words, the research sought to find out whether bank efficiency contributes to short-term shareholder value creation, which is represented by positive cumulative abnormal returns (CARs) that are realized when news of an impending merger are released. The study aimed to fill a gap that exists in the literature on European bank mergers. Although there have been a number of studies that have investigated shareholder value creation in European bank mergers, there were none until recently that had addressed the effect of bank efficiency on CARs. To my knowledge, the study by Chronopoulos *et al*. (2010) is the first European study to examine the influence of bank efficiency on CARs. However, that study differs considerably from this in that it does not go beyond performing correlations and univariate regressions of efficiency variables and CARs. This study, on the other hand, performs regressions which involve efficiency variables and control variables that are known to influence CARs. While Chronopoulos *et al*. (2010) use data envelopment analysis (DEA) to estimate efficiency, this study uses the stochastic frontier approach (SFA). Another major difference between the two studies is that, whereas this study analyzes both pre-merger and post-merger efficiency, Chronopoulos *et al*. (2010) look only at the latter. A few other differences between the two studies are discussed in Chapter Six.

There are two studies that have examined the effect of bank efficiency on CARs using US data. This study follows mostly the study by Aggarwal *et al*. (2006), although they investigate only profit efficiency, while this study analyzes both cost and profit efficiency. Recognizing the need

to see whether the choice of the event window whose CARs are used in the analysis may affect the inferences that may be drawn from the investigation, this study examined the CAR windows used in both of the US studies. The two-day CAR window used in the Kohers *et al*. (2000) study (announcement and the next day) was in this case used for comparison purposes. Also, this study mainly uses control variables common to both US studies.

This study begins by looking at developments in European banking that have occurred over approximately the past three decades in Chapter One. All the common themes of deregulation, competition, consolidation, internationalization, integration and concentration are mentioned to provide the background against which this study was undertaken. In Chapter Two consolidation is discussed in detail, ending on the positive note that in Europe, most studies investigating post-2000 data increasingly find that mergers are beneficial to both the bidder's and the target's shareholders. Earlier studies have usually reported inconclusive results, or, as in the US, gain to the target's shareholders at the expense of the bidder's. Relevant literature is cited throughout the chapter as it is done in all of the other chapters. Chapter Four considers efficiency concepts and identifies the stochastic frontier approach that was used in this study for estimating efficiency. The main chapters of empirical work are Chapter Three, Chapter Five, and Chapter Six. In order to give a broad picture of the investigation, results obtained in these chapters are presented with considerable detail. The results obtained in Chapter Three and Chapter Five are analyzed in Chapter Six to generate the main findings of the study. In Chapter Three, CARs are obtained for various windows within the event period for the main sample and for several sub-samples. Most of the sub-samples used are similarly analyzed in the bank efficiency and shareholder value creation literature. In Chapter Five, cost and profit efficiency are estimated for the main sample as well as for several sub-samples, again as found in the literature. Both pre-merger and post-merger efficiency are estimated. In Chapter Six, regressions are performed using five different efficiency variables and six different control variables. Both cost and profit efficiency variables are analyzed after being determined on the basis of theory. And both $CAR_{-1, 0}$ and $CAR_{0, +1}$ are used as the dependent variable in the regressions performed.

7.1 Main Findings

The main finding of this study is that bank efficiency contributes to short-term shareholder value creation. Specifically, bank efficiency has a significant positive effect on CARs when a bidder merges with a less efficient target, or peers are more efficient than targets, or peers are more efficient than both targets and bidders. The result is consistent with theory, as discussed in the conclusion to Chapter Six. Corollary to this finding is the contribution of post-merger efficiency. While the market contemplates how to react to merger announcement on the basis of pre-merger efficiency performance, it simultaneously considers the merger's implication for future efficiency performance. The study finds that the market's reaction is a prediction of post-merger efficiency. In particular, the market's reaction on merger announcement indicates that it is possible market participants are more inclined to use information available for predicting profit efficiency than cost efficiency. On the other hand, it is understandable that the market would be more interested in future profit efficiency than cost efficiency since it yields the more direct benefit to shareholders, while cost efficiency benefits consumers more directly. Also, it has to be said that, as pointed out in Chapter 4 (section 4.2.1), profit efficiency is a broader concept than cost efficiency as it embraces both revenue and costs. It therefore makes sense for the market's prediction of future efficiency to be associated more with profit efficiency than with cost efficiency.

7.2 Other Findings

Whereas the main findings of this study come from the analysis in Chapter Six, other findings can be found in the other analysis chapters, Chapter Three and Chapter Five. Briefly, Chapter Three finds overall that bidders' shareholders realize value creation upon merger announcement. This result is consistent with those of other post-2000 studies which increasingly report value gains for both target and bidder shareholders in European bank mergers. Another notable finding in Chapter Three is that the market reacted to merger announcements involving Central and Eastern European (CEE) targets and those involving Western European (WEE) targets similarly.

One would expect that mergers involving targets from CEE countries would be viewed less favourably on account of being the less advanced region in terms of level of development of financial markets. It is noteworthy that all bidders came from WEE countries, so that comparison is between WEE/WEE and WEE/CEE mergers. This may mean that market participants viewed mergers' performance prospects the same for the two regions, a development that suggests a narrowing of the gap between the financial markets in the two regions as desired by the various legislative reforms that have promoted the movement towards a European Single Market.

In Chapter Five, peers are found to be more cost and profit efficient than the merged firms. This is not an unusual result as peers not intending to engage in mergers tend to implement efficiency-enhancing strategies in order to keep up with merging firms, many of which cite efficiency improvement as their main motive for merger. Cross-border mergers are more cost and profit efficient than their domestic counterparts. Again, this is not an unexpected result as firms that go abroad have often been found to be larger and more efficient than those which engage in domestic deals. Targets are more cost efficient than bidders, while bidders are more profit efficient. This suggests a targeting of more cost efficient firms by profitable firms that are confident of post-merger profitability if they will not have to implement overwhelming cost-cutting strategies. The market seems to recognize this by foreseeing improved profitability more than it predicts cost efficiency improvement as concluded in the main findings above. Mergers that took place in 2001 did not improve in efficiency in the first three years of merger, while those that occurred in 2002 and 2003 experienced improvements in profit efficiency in a similar period. Comparing the performance of cross-border and domestic mergers after merger, the study finds that overall cross-border mergers perform marginally better than domestic deals. For mergers that took place in 2002, domestic deals improved in profit efficiency in all the three years post-merger, but did not experience any cost efficiency enhancements in that period. Cross-border deals, on the other hand, improved in both cost and profit efficiency for two years, while not recording any improvements for one of those years. In the 2003 deals, cross-border mergers improved in profit efficiency in all the three post-merger years and in cost efficiency in two of those years. Domestic mergers, meanwhile, gained in profit efficiency in all the three years, the same as cross-border mergers, but did not improve in cost efficiency in any of those

years. These results suggest, once again, that profit efficiency and not cost efficiency was the measure of choice for the market in its evaluation of predicted future performance.

7.3 Implications of the Study's Findings

In Chapter One, this study summarized the mainly environmental developments that have changed the way banks do business. Banks are primarily different from other industries because they are regulated. Being regulated was not particularly challenging before the developments that have occurred in roughly the last three decades. In that time competition has increased in banking, mostly from other banks as cross-border restrictions were eased, but also from non-bank institutions that now offer products originally provided only by banks, and from the financial markets which now offer services that were the preserve of commercial banks. In the current environment, banks are still regulated, though not as stringently as before, they are expected to grow and, most importantly, they are still expected to show returns to shareholders. In the light of competition and the need for growth, policy makers and other stakeholders ought to be concerned about the ability of banks to still manage to meet their obligations to their shareholders. This is more so in view of the results reported in most of the earliest merger studies that find that mergers destroy value for the bidder's shareholders. Although most of those studies were performed in the US, the best outcome that early European studies reported on the issue of value creation on merger announcement was that the results were inconclusive. As pointed out in Chapter Two, there is a new optimism raised by a review of both European and US studies that shows that post-2000 European studies find increasingly that there is value creation for the bidder's shareholders in bank merger announcements. This alone is not adequate for letting the matter to rest. Rather, there is need to see more studies that will consolidate the new optimism. As already pointed out above, the findings in this study are in general agreement with the views of those who think that European bank mergers create value for the bidder's shareholders on merger announcement.

Value creation at the time of merger announcement, though important, is not enough for declaring a merger successful. What is required is evidence of performance improvement in the post-merger period. There are very few studies that investigate shareholder value creation post-

merger because of the complexity of its analysis and the many events that happen in any business from time to time that may influence post-merger CARs. However, there have been studies that have investigated performance improvement using other measures, including efficiency. In this study, post-merger efficiency is investigated for the mergers that took place in 2001, 2002, and 2003 as already reported. What emerges from the results is that, while overall there is some evidence of improvement in profit efficiency, evidence of cost efficiency improvement is either very weak or non-existent. This result is intriguing in the light of evidence that in the post-merger period, European banks pursue cost-cutting strategies meant to improve cost efficiency, while US banks pursue revenue-enhancing strategies to improve profit efficiency (Hagendorff *et al*., 2009). The result may be important to policy makers as well as other stakeholders because banks that are not cost efficient are likely to offer products at prices that are higher than they should be. If, in addition, such banks happen to exercise market power where they operate, the likelihood of consumers being overcharged for bank services will be high. While the argument against unimproved cost efficiency may be valid, it is important to remember that the period considered is only three years, the first two of which were probably spent on implementing integration. It is also a time when the bank might have been investing in areas which would ensure sustained good performance of the combined firm in the future.

Some studies have concluded that it takes longer than three years for post-merger improvements to be realized (Cuesta and Orea, 2002). There is no standard period that has been agreed upon as the ideal that can be used to determine the success or otherwise of a merger based on post-merger performance. It may well be that this aspect is best left for consideration on a merger to merger basis because of the different circumstances that different combined firms operate in after merger. Also, one has to take into account the fact that institutions change with time so that estimating efficiency, for example, after that period, may no longer be valid for pre-merger and post-merger performance comparison. Another thing to bear in mind is that, while applauding improvement in profit efficiency, it is also true that, as pointed out earlier, pre-merger target efficiency was very low and in some cases so low that, in my view, the market considered it unlikely that it could be improved within the desired time after merger. It is possible that, due to this, the combined bank made it a priority to raise profit efficiency after merger, and this could

have been one of the motives for the merger in the first place. On the basis of these arguments, and in the absence of high-priority investments, the best course of action when the situation is as described is to evaluate post-merger performance over a period of, for example, five years after merger.

There is one final comment with regard to the results obtained in this study that concerns the targets. This is in connection with a reflection stated in Aggarwal *et al*. (2006) that, from their analysis of pre-merger financial performance covering three years, the bidders had pursued a performance-enhancing strategy for some time in anticipation of their expansion strategy. Similar observations can be found in other areas of the literature. In fact, literature exists that provides advice on how to acquire or be acquired. If this is the case, one may wonder why the targets included in this study would not prepare themselves for merger, at least to aim for the best price. Unfortunately, the scope of this study did not include determination of the fairness or otherwise of the merger price. It would be interesting to know how much the targets were worth at the time of merger and what subsequently happened to their managements. This may be one of those cases referred to in the literature where the target's management personnel are relieved of their responsibilities immediately upon merger. If considered carefully, however, preparing for merger can be by doing something or by doing nothing. In extreme cases, it is possible that, once resigned to being taken over, some firms' managements decide to only wait for the day. In other cases, the management may have tried everything but failed to improve the situation. This may sometimes be associated with the economic environment, which in most cases would be beyond the management's control. The results presented in Chapter Five show that pre-merger, the targets were more cost efficient than the bidders. This is an indication of an active management that at least prepared for the merger in this way. With more information, further analysis might actually show that under-performance in cost efficiency in the post-merger period is attributable more to the bidders than to the targets. Considering such an issue from all the angles possible demonstrates that it is not easy to draw quick conclusions on most of the various aspects of mergers. Knowing this is important for both policy makers and researchers in the area, as well as for other stakeholders. It would be useful if the scope of information provided by merging banks

would be expanded either voluntarily or by legislation, to make it possible for future researchers to go deeper than it is sometimes possible with most of the data available from current databases.

7.4 Limitations of the Study

The foremost limitation of the analyses conducted in this study is that the sample used is rather small. In an attempt to make firms included in the sample as homogeneous as possible, the study undertook to investigate only commercial banks, without mixing them with other financial institutions as it has been done by so many other bank merger studies. In addition, only mergers where the latest acquisition resulted in at least 50% ownership were accepted to form the sample. Also, after excluding firms not listed on any stock exchange, and those for which financial statements were not available, the sample reduced to a very small number considering the nature of this research. In such a study, a small sample will always give rise to serious challenges of statistical significance due to the need for partitioning the sample at various stages of the investigation.

Data on mergers and acquisitions were obtained from the Reuters database and from the Mergers and Acquisitions magazine, both of which are reliable and used by many researchers for similar studies. The Mergers and Acquisitions magazine was particularly useful for providing the information on the method of merger payment. Financial statements were obtained from the Bankscope database, another very reliable source and widely used. Historical share prices were obtained from the website of Yahoo Finance which, though reliable, does not command the reputation that the other sources do, and to my knowledge is not as widely used by researchers. It was used because of lack of access to other sources. However, it is highly unlikely that use of Yahoo information in any way invalidates the results obtained in this study.

Another limitation of this study is that mergers forming the sample examined were not randomly selected due to the limited number of deals that took place in the period investigated. This is yet another reason why any conclusions drawn from the results obtained in this research are this study-specific and cannot be generalized. It is to be noted, however, that this is not a limitation of this study alone, and tends to be common for most European merger studies.

As it is with most research, this study faced time and resource constraints that prevented it from pursuing the sources of some of the unusual results obtained, for example why target profit efficiency was so low, and why the 2001 mergers produced the worst post-merger efficiency performances.

7.5 Avenues for Further Research

As already mentioned, this is the first European study to examine the effect of bank efficiency on shareholder value creation on bank merger announcement that has been investigated along the same lines as the only two US studies to be found in the literature. The only European study that addresses the same issue differs considerably from this investigation as already discussed. It would be useful to extend this study with larger samples and a longer period of data.

In a study that produces results similar to those reported in this study, it would be a good thing if it went further to, for example, examine why target profit efficiency was so low and why the mergers that took place in 2001 produced the worst post-merger efficiency performances. An analysis of post-merger performance for a longer period than three years using a larger sample would probably lead to better results than the ones reported in this study.

Further research will certainly be needed not only for bank mergers but also for other financial institutions' mergers and conglomerate mergers. Also, it would be interesting to see similar studies performed at national level, but it is not easy to get a suitable sample for this kind of research. The good thing with a national study is that the financial market would be the same, and the results could be compared across countries and between country and multi-country study results like those presented in this study. In fact, some research is also needed to find out how combining firms quoted on stock exchanges of different countries affects the results.

Lastly, it would be interesting to see how the global financial crisis that began in the second half of 2007 is going to affect the results of post-2007 merger studies similar to this and other efficiency studies.

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